# SERVICE MANUAL

## The ZoneAire Sleep Surface System

From Hill-Rom®

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man121-e1

**Product No. P993-00**

**For Parts Or Technical Assistance**
**USA 1-800-445-3720 Canada 1-800-267-2337**

# *ZoneAire Sleep Surface System Service Manual*

## Revisions

| Revision Letter | Pages Affected | Date |
|---|---|---|
| Original Issue | | May, 1996 |

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First Edition

First Printing 1996

Printed in the USA

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# Chapter 1 Introduction

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## Purpose of this Manual

This manual provides the information required for Hill-Rom ZoneAire Sleep Surface System normal operation and maintenance. It also includes a complete parts list for ordering replacement components. The parts list is located in chapter 5.

## Who Should Use this Manual

This manual is intended to be used by facility authorized maintenance personnel only. Failure to observe this restriction can result in serious damage to material and/or severe injury to people.

## Organization of this Manual

This manual contains seven chapters.

### Chapter 1: Introduction

You are currently reading chapter 1. This chapter defines the manual's purpose and who should use the information in the manual. It also describes the manual's organization and explains the various typographical conventions used throughout the manual. Also included is an introduction to the product, specifications, model identification, safety tips, and the ZoneAire Sleep Surface System caution and warning labels.

### Chapter 2: Troubleshooting Procedures

Chapter 2 contains the proper ZoneAire Sleep Surface System troubleshooting procedures. It also includes a troubleshooting introduction, initial actions, function checks, final actions, and repair analysis procedures.

### Chapter 3: Theory of Operation

Chapter 3 contains the hardware and software theory of operation of the ZoneAire Sleep Surface System. It also includes the wiring diagrams and a block diagram for the ZoneAire Sleep Surface System.

## Chapter 4: Removal, Replacement, and Adjustment Procedures

Chapter 4 includes removal, replacement, and adjustment procedures for the ZoneAire Sleep Surface System components.

## Chapter 5: Parts List

Chapter 5 contains Hill-Rom's warranty, replacement part ordering procedure, exchange policy, illustrated parts lists, and general service information.

## Chapter 6: General Procedures

Chapter 6 contains cleaning and care, lubrication requirements, preventive maintenance, ZoneAire Sleep Surface System tool and supply requirements.

## Chapter 7: Accessories

Chapter 7 includes available ZoneAire Sleep Surface System accessories, illustrations, and mounting instructions.

## Typographical Conventions Used in this Manual

This manual contains different typographical conventions designed to enhance readability and understanding of its content. Note the following examples:

- Standard text—used for standard text throughout the manual.
- **Boldface text**—emphasizes a word or phrase.
- **NOTE:**—sets apart special information or important instruction clarification.
- The symbol below highlights a CAUTION or WARNING:

**Figure 1-1. Caution and Warning Symbol**

  - A CAUTION points out special procedures or precautions that service personnel must follow to avoid equipment damage.
  - A WARNING identifies situations or actions that may affect patient or user safety. Disregarding a warning could result in patient or user injury.

- The symbol below highlights an electrical shock hazard warning:

**Figure 1-2. Electrical Shock Hazard Warning**

# Introduction to the ZoneAire Sleep Surface System

## Overview

The ZoneAire Sleep Surface System is a zoned mattress replacement product providing for the prevention and treatment of pressure ulcers in acute care. All necessary electronic and pneumatic components are packaged in a single control housing. The system is transportable from bed to bed and can be used on both hard pan and fabric surfaces.

# Specifications

## Physical Description

The ZoneAire Sleep Surface System consists of the following:

- Sleep surface (mattress)
- Power unit assembly
- Caregiver pendant
- Patient pendant (optional)

### Mattress Specifications

#### Dimensions

35" x 84"

- Advance Series bed (3 motor): 1100, 1110, 1120, 1130, 1140
- Advance Series bed (4 motor): 1105, 1115, 1135, 1145
- 840 and 850 series bed: 840, 842, 850, 852
- Centra bed (4 motor): 1060, 1061, 1062, 1063, 1064

35" x 80"

- Century Series bed: 835, 837
- 425, 426, 715, 720, 723, 820, 822

32" x 79"

- Century CC bed: 892, 894, 895, 896

### Mattress Ticking

The zippered clam shell design polyester ticking covers both foam and air bladder components. The bottom portion of the ticking has six magnets enclosed in pockets located around the outer edge of the mattress. The magnets help hold the mattress and sheets in place by adhering to the metal sleep surface. For beds with a spring fabric deck, a buckle located at the footend of the mattress holds the mattress in place.

### Mattress Top and Bottom Foam

The top foam is segmented to provide different densities of support for the patient. It also provides some protection against punctures to the upper bladder from needle sticks and other sharp objects.

The bottom foam is shaped like a tub with dense side walls. The foot end is cut out to allow room for the surface control module and locator plate. This tub cradles the upper and lower air bladders.

### Mattress Main Air Bladders—Upper and Lower

The main air bladders are contained inside the bottom foam section. The upper and lower main air bladders are identical, only the hose connections from the surface control module determine the bladder functions. These two air bladders are segmented into three sections: the head, seat, and thigh sections.

### Heel Air Bladder

The heel air bladder is divided into three zones: 1, 2, and 3. These zones are connected to and controlled by the surface control module.

### Air Hoses

The ZoneAire Sleep Surface System has one air hose that connects the air pump to the surface control module inside the mattress. This air hose both inflates and deflates the air bladder.

Six air hoses connect the air manifold to the mattress air bladders. These air hoses are used for both inflate and deflate functions. The air manifold is located on the surface control module inside the mattress.

Six air hoses connect the mattress air bladders to the pressure sensors. The pressure sensors are located on the surface control module inside the mattress.

#### Multiple Zone Bladders

The sleep surface consists of multiple zone bladders to provide significant improvement in the reduction of patient interface pressure. Multiple zone bladders allow greater patient and/or nurse adjustment to particular parts of the patient's body. The multiple zones consist of six different zones. The six zones are the head, seat, thigh, and heel zones 1, 2, and 3.

#### Power Unit Assembly

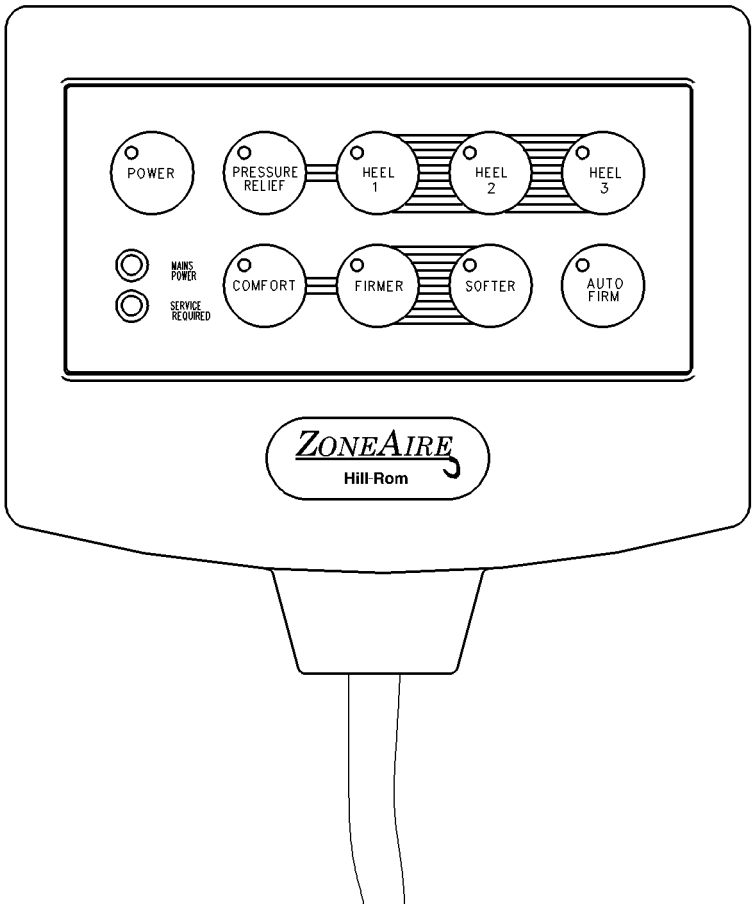
The power unit assembly consists of an aluminum housing and a plastic case cover. These two parts enclose all of the electronic and pneumatic components not contained within the sleep surface. The power unit assembly attaches to the mounting posts in place of the headboard. This unit weighs approximately 29 pounds.

### Caregiver Pendant

The caregiver pendant contains the following switches and LED's (see figure 1-3 on page 1-9):

- Sleep surface power switch and green LED
- Pressure relief switch and green LED
- Heel relief 1 switch and green LED
- Heel relief 2 switch and green LED
- Heel relief 3 switch and green LED
- Comfort switch and green LED
- Firmer switch and green LED
- Softer switch and green LED
- Auto firm switch and green LED
- Service required yellow LED
- Mains power green LED

**Figure 1-3. Caregiver Pendant**

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## Modes of Operation

The ZoneAire Sleep Surface System has four patient care modes. They are pressure relief, heel relief, auto firm, and comfort. The choice of mode is best determined through an assessment of the patient as to his or her risk of pressure ulceration.

To activate the ZoneAire Sleep Surface System, press the POWER button on the caregiver pendant. The LED light on the POWER button will illuminate, indicating the system is on. The pressure relief LED will automatically illuminate as pressure relief is the default mode. If the comfort mode is desired, press the COMFORT button.

## Comfort Mode (Optional)

For patients assessed not to be at-risk, the surface can be placed in the comfort mode. This gives the caregiver control of the firmness or softness of the surface. This is accomplished by the caregiver pressing the COMFORT touch pad control within the caregiver pendant. The firmness/softness of the Surface can be controlled by caregivers through the FIRMER and SOFTER touch pad controls.

The FIRMER switch LED will flash indicating that the surface is at full firm:

- All six zones have reached the full firm pressure and the caregiver pendant FIRMER switch is pressed.

The SOFTER switch LED will flash indicating that the surface is at full soft:

- All six zones have reached the full soft pressure and the caregiver pendant SOFTER switch is pressed.

**NOTE:**
The COMFORT MODE can be activated only when the optional patient pendant is connected to the system power unit, located at the head of the bed.

## Pressure Relief Mode

For patients assessed to be at-risk of ulceration and who require pressure relief, the surface should be placed in the pressure relief mode. This is accomplished by the caregiver pressing the PRESSURE RELIEF touch pad control within the caregiver control pendant. In the pressure relief mode, the pressure within each zone of the surface is automatically maintained to optimize interface pressure. Air volumes are changed to control the surface around the patient's body, especially bony prominences, to more evenly distribute pressure across the body. The surface adjusts not only to patient's weight distribution but to patient position and bed articulation.

When the ZoneAire Sleep Surface System is placed in the pressure relief mode, the green LED light on the PRESSURE RELIEF button will illuminate, reminding caregivers that the surface is in the proper mode for the patient. When in the pressure relief mode, the caregiver no longer has control of the surface.

### Auto Firm Mode

To facilitate patient handling, the caregiver can press the AUTO FIRM button within the caregiver pendant. The auto firm mode will fully inflate all the air bladders within the surface making the surface very firm. The patient's body will no longer displace air from the air bladders but will be raised up by the surface. This allows the caregiver to more easily handle the patient during ambulation, repositioning, procedures within the bed, and transfers from the bed. To put the surface back to its original setting press the AUTO FIRM button again to turn the mode off.

When the auto firm mode is engaged, the mode will only stay active for one hour. After one hour, it will default to its previous mode. This ensures that the patient does not rest on a firm surface for an extended period of time.

### Heel Relief Mode

To put the surface in the heel relief mode the system must be in the pressure relief mode first. For patients who are assessed to be at-risk of ulceration, require pressure relief and whose level of mobility is such that the patient's heels are at particular risk of ulceration, the heel relief mode should also be utilized. To engage the heel relief feature, press one of the three HEEL touch pad buttons within the caregiver control pendant, either HEEL 1, 2, or 3. To determine which HEEL relief button to press, observe the patient's heel position relative to the heel indicator buttons attached to both sides of the mattress. These heel indicator buttons may be felt beneath the sheets to be small, round, raised areas. The buttons are grouped to indicate heel position.

If the patient's heels are positioned between the single button and the group of two buttons, this is heel position 1 and HEEL 1 should be pressed.

If the patient's heels are positioned between the group of two buttons and the group of three buttons, this is heel position 2 and HEEL 2 should be pressed.

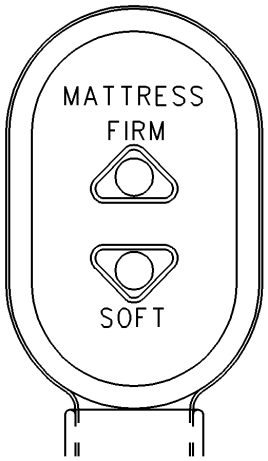
If the patient's heels are positioned between the group of three buttons and the foot of the bed, this is heel position 3 and HEEL 3 should be pressed.

Once the heel relief mode has been engaged, check to ensure that the proper button has been pushed (HEEL relief buttons 1, 2 or 3). This can be done by examining the Surface under the patient's heels. When engaged properly, the Heel Relief Mode will lower the Surface under the heels and slightly raise the surface under the calves. This has the effect of transferring a great percentage of the support of the foot from the heel to the calf and, consequently, significantly reduces the interface pressure on the heel.

## Patient Pendant (Optional)

For patients assessed not to be at-risk, the surface can be placed in the comfort mode by pressing the COMFORT button on the caregiver pendant. The patient can control the firmness or softness of the Surface by pressing the FIRM or SOFT touch pad controls on the optional patient pendant. The caregiver can control the firmness or softness of the surface through the FIRMER and SOFTER touch pad controls located on the caregiver pendant.

**Figure 1-4. Patient Pendant**

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**NOTE:**
If the patient pendant is not connected to the system power unit, neither the patient, nor the caregiver will be able to adjust the firmness or softness of the mattress.

If the patient pendant is removed, the ZoneAire Sleep Surface System will default to the pressure relief mode.

## Electrical Description

All ZoneAire Sleep Surface Systems are factory tested for complete operation and insulation integrity.

The ZoneAire Sleep Surface System operates on 120 volts, 60 Hz, single phase power.

The supply cord is #18 AWG, three conductor type STO, and extends 100" from the power unit assembly. The supply cord and molded plug are UL and CSA listed hospital grade.

## CSA/UL Classification

- Class grounded equipment per UL 544
- CSA risk class 2G per CA per CSA 22.2

# Model Identification

**Table 1-1. Model Identification**

| Model | Description |
|---|---|
| 462 | ZoneAire Sleep Surface System |

## Safety Tips

**WARNING:**
Do not use the ZoneAire Sleep Surface System in the presence of flammable gas or vapors. A fire and explosion hazard in this environment exists as a result of equipment operation.

**WARNING:**
Do not use this product with an oxygen tent.

**WARNING:**
The heel relief feature is ineffective when the system is used with a bed extender.

**WARNING:**
This product is recommended for use with Hill-Rom headwalls. Observe wall clearance when using this product.

**WARNING:**
The ZoneAire Sleep Surface System will extend 2 1/4" beyond the head end channel of the Century CC bed when installed. Observe wall clearance when using this product.

**WARNING:**
The ZoneAire Sleep Surface System will extend 3" beyond the head end channel of the retractable frame when installed. Observe wall clearance when using this product.

**WARNING:**
The ZoneAire Sleep Surface System will extend 3 1/2" beyond the head end channel of the non-retractable frame when installed. Observe wall clearance when using this product.

**CAUTION:**
Do not use the bed exit system with the ZoneAire Sleep Surface System on a spring fabric surface.

**CAUTION:**
The sliding permanent IV pole is not compatible with the ZoneAire Sleep Surface System.

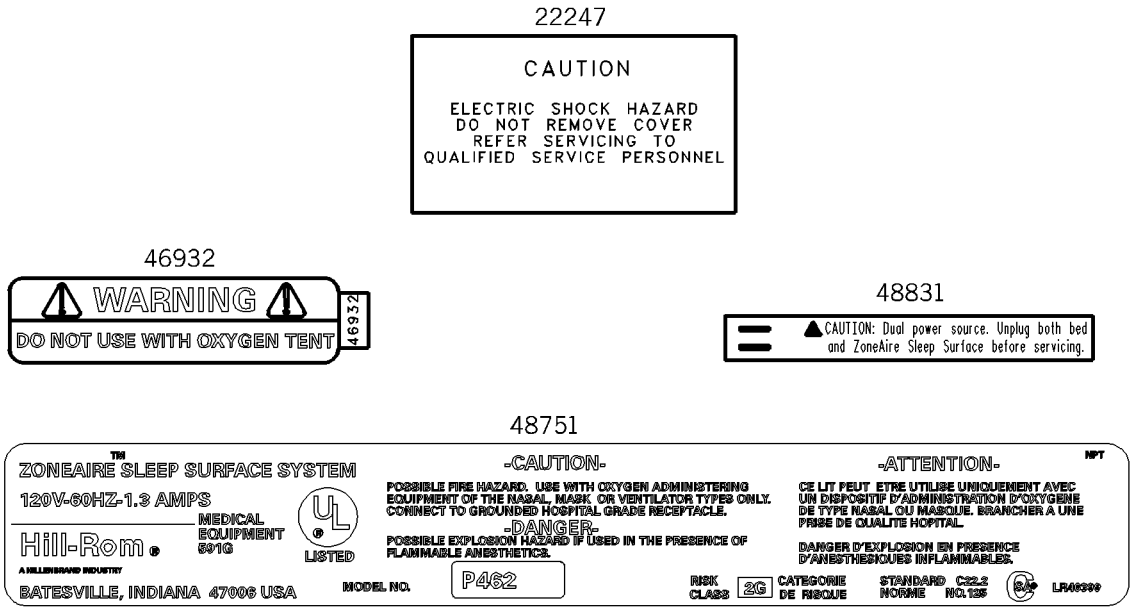
**CAUTION:**
The EnhanceMate Voice Activated Control System is compatible with the ZoneAire Sleep Surface System and should be installed before installing the power unit assembly.

**CAUTION:**
Do not raise the convertible footboard on the critical care bed with the caregiver pendant attached.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

# Caution and Warning Labels

**Figure 1-5. Caution and Warning Labels**


22247
CAUTION
ELECTRIC SHOCK HAZARD
DO NOT REMOVE COVER
REFER SERVICING TO
QUALIFIED SERVICE PERSONNEL
46932
WARNING
DO NOT USE WITH OXYGEN TENT
46932
48831
CAUTION: Dual power source. Unplug both bed and ZoneAire Sleep Surface before servicing.
48751
ZONEAIRE SLEEP SURFACE SYSTEM
120V-60HZ-1.3 AMPS
MEDICAL EQUIPMENT 591G
LISTED
Hill-Rom
A HILLENBRAND INDUSTRY
BATESVILLE, INDIANA 47006 USA
-CAUTION-
POSSIBLE FIRE HAZARD. USE WITH OXYGEN ADMINISTERING EQUIPMENT OF THE NASAL MASK OR VENTILATOR TYPES ONLY. CONNECT TO GROUNDED HOSPITAL GRADE RECEPTACLE.
-DANGER-
POSSIBLE EXPLOSION HAZARD IF USED IN THE PRESENCE OF FLAMMABLE ANESTHETICS.
-ATTENTION-
CE LIT PEUT ETRE UTILISE UNIQUEMENT AVEC UN DISPOSITIF D'ADMINISTRATION D'OXYGENE DE TYPE NASAL OU MASQUE. BRANCHER A UNE PRISE DE QUALITE HOPITAL.
DANGER D'EXPLOSION EN PRESENCE D'ANESTHESIQUES INFLAMMABLES.
MODEL NO.
P462
RISK CLASS 2G CATEGORIE DE RISQUE
STANDARD C22.2 NORME NO.125
LR40399

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# Chapter 2
# Troubleshooting Procedures

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Triac Open . . . . . 2 - 31
LON Communication Error . . . . . 2 - 37
Key Stuck Closed . . . . . 2 - 39
ZoneAire Sleep Surface System Does Not Work. . . . . 2 - 40

**NOTES:**

## Getting Started



**WARNING:**
Only qualified service personnel should do troubleshooting on the ZoneAire Sleep Surface System. Before beginning any troubleshooting, be sure that you have read and understand the information in the troubleshooting section.

Begin each procedure in this chapter with step 1. Follow the sequence outlined (each step assumes the previous steps are correct). Each step is the normal operational event of the product and can be confirmed by answering Y (yes) or N (no) to the statement. Your response will lead to another step in the procedure, a repair analysis procedure (RAP), or to a component replacement. If more than one component is listed, replace them in the order given.

Start with **Initial Actions** to begin gathering information about the problem.

Perform the **Function Checks** to isolate/identify a problem and to verify repair after completing each corrective action (replacing or adjusting a part, seating a connector, etc.).

Perform the **Final Actions** after the Function Checks to verify the repair.

If troubleshooting procedures do not isolate the problem, call Hill-Rom Technical Support at (800) 445-3720 for assistance.

## Initial Actions

Initial Actions are used to gather information from operators concerning problems with the ZoneAire Sleep Surface System. Note symptoms or other information concerning the problem the operator identifies. This information helps identify the probable cause.

1. Someone who can explain the problem is available.

   **Yes** **No**
   ↓ → Go to “Function Checks” on page 2-4.

2. Ask that person to demonstrate or explain the problem. The problem can be duplicated.

   **Yes** **No**
   ↓ → Go to “Function Checks” on page 2-4.

3. The problem is a result of improper operator action.

   **Yes** **No**
   ↓ → Go to “Function Checks” on page 2-4.

4. Instruct the operators by referring them to the procedures in the *ZoneAire Sleep Surface System In-Service Manual*. Perform the “Function Checks” on page 2-4 to ensure proper operation of the ZoneAire Sleep Surface System.

## Function Checks

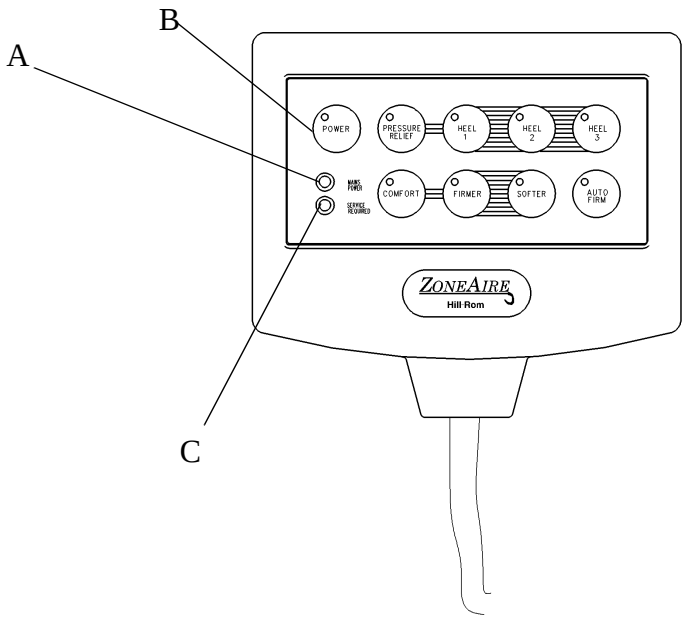
There are three types of diagnostic tests that can be run on the ZoneAire Sleep Surface System. These tests are the caregiver pendant diagnostic test, valve driver diagnostic test, and pneumatic components diagnostic test.

During these diagnostic tests the ZoneAire Sleep Surface System automatically checks each component. The caregiver pendant will display a **flashing** LED indicating any improperly functioning area of the ZoneAire Sleep Surface System.

There are eight switches and corresponding LED indicators located on the caregiver pendant that are used for doing diagnostic testing (see figure 2-1 on page 2-5):

- Pressure relief switch and green LED
- Heel relief 1 switch and green LED
- Heel relief 2 switch and green LED
- Heel relief 3 switch and green LED
- Comfort switch and green LED
- Firmer switch and green LED
- Softer switch and green LED
- Auto firm switch and green LED

**Figure 2-1. Caregiver Pendant**

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The service required LED is located on the caregiver pendant. Observe the different flashes (signals) and count the number of times the LED flashes to determine the area that requires service.

1. Initial Actions have been performed.

   **Yes** **No**
   ↓ → Go to “Initial Actions” on page 2-3.

2. The system is plugged into an appropriate power source and the mains power LED (A) on the caregiver pendant is on.

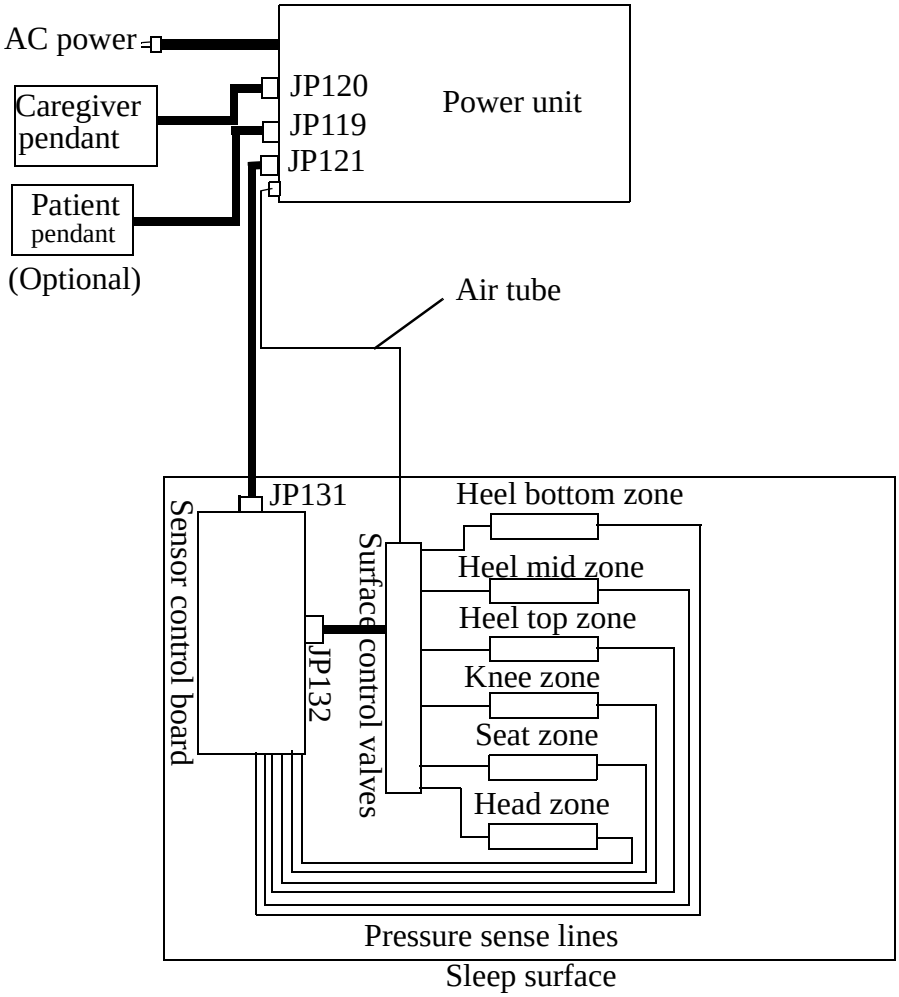
   **Yes** **No**
   ↓ → Plug the system into an appropriate power source. If the mains power LED comes on, continue to step 3. Otherwise, go to RAP 2.9.

3. The cables and air tubes are installed and connected properly (see figure 2-2 on page 2-6).

   **Yes** **No**
   ↓ → Connect the cables and air tubes. If this solves the problem, continue to step 4.

2

**Figure 2-2. Cable Connection**




4. Press the power switch on the caregiver pendant. The power switch LED (B) comes on (see figure 2-1 on page 2-5).

   **Yes** ↓

   **No** → Check the caregiver pendant cable for proper connection. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.9.

5. Observe the service required LED (C) on the caregiver pendant. The service required LED flashes.

   **Yes** ↓

   **No** → Continue to "Caregiver Pendant Diagnostic Test" on page 2-7.

6. Use table 2-1 on page 2-7 to locate the description of the problem you are having. Then, perform the action in the solution column.

**Table 2-1. Service Required LED Fault**

| Number of Flashes | Name of Error | Solution |
|---|---|---|
| 1 | Slow leak | Go to RAP 2.1 |
| 2 | Continuous run | Go to RAP 2.2 |
| 3 | Triac short | Go to RAP 2.3 |
| 4 | Sensor EEPROM | Go to RAP 2.4 |
| 5 | Mattress disconnect | Go to RAP 2.5 |
| 6 | Triac open | Go to RAP 2.6 |
| 7 | LON communication | Go to RAP 2.7 |
| 8 | Key stuck closed | Go to RAP 2.8 |



## Caregiver Pendant Diagnostic Test

This test only checks the caregiver pendant.

1. Press the power switch on the caregiver pendant to turn the system off. The power switch LED goes out and the mains power LED stays on.

   **Yes** ↓ **No** → Replace the caregiver pendant, and start the“Function Checks” on page 2-4 over. If the problem still exists, go to RAP 2.9.

2. Press the comfort and heel 3 switches on the caregiver pendant at the same time, and hold for 4 seconds. The service required LED flashes.

   **Yes** ↓ **No** → Replace the caregiver pendant, and start the“Function Checks” on page 2-4 over. If the problem still exists, go to RAP 2.9.

3. After 4 seconds all caregiver pendant LEDs come on and stay on.

   **Yes** ↓ **No** → Replace the caregiver pendant, and start the“Function Checks” on page 2-4 over. If the problem still exists, go to RAP 2.9.

4. Press each switch on the caregiver pendant. As each switch is pressed, the corresponding LED goes out.

**NOTE:**
You must complete step 4 in 1 minute, or the test will automatically end.

**Yes** ↓ **No** → Replace the caregiver pendant, and start the“Function Checks” on page 2-4 over. If the problem still exists, go to RAP 2.9.

2

5. Press the power switch again, or wait 1 minute to exit this test. The pendant diagnostic test ends after 1 minute, service required LED goes out, and the mains LED stays on.

   **Yes** **No**
   ↓ → Replace the caregiver pendant, and start the "Function Checks" on page 2-4 over. If the problem still exists, go to RAP 2.9.

6. Continue to "Valve Driver Diagnostic Test" on page 2-8.

## Valve Driver Diagnostic Test

This test confirms the air mattress board has sent proper voltages to the individual components. The mattress cable does not have to be connected to the power unit to perform this test.

The valve driver diagnostic test determines if power is being applied to each pneumatic component. The system must be in the standby mode (off) when you run this test.

1. Press the power switch on the caregiver pendant to turn the system off. All switch LEDs and the service required LED go out. The system is in the standby mode.

   **Yes** **No**
   ↓ → Go to RAP 2.9.

2. Press the pressure relief and auto firm switches simultaneously and continuously for 4 seconds. Each caregiver pendant LED comes on for at least 7 seconds, one at a time, and the sleep surface power LED flashes.

   **Yes** **No**
   ↓ → Go to RAP 2.9.

**NOTE:**
When checking each device of the system, the caregiver pendant LED corresponding to the device will flash. When finished checking all drive circuits, appropriate caregiver pendant LEDs will be on steady for **good** drive circuits and flash for **bad** drive circuits. The sleep surface power LED will flash until the results are finished being displayed. The valve/LED relationships are outlined in table 2-2 on page 2-9.

**Table 2-2. Valve LED Relationship**

| Valve Driver | LED |
|---|---|
| Head manifold valve driver | Pressure relief switch LED |
| Seat manifold valve driver | Heel 1 switch LED |
| Knee manifold valve driver | Heel 2 switch LED |
| Heel top manifold valve driver | Heel 3 switch LED |
| Heel middle manifold valve driver | Comfort switch LED |
| Heel bottom manifold valve driver | Firmer switch LED |
| Pump driver | Softer switch LED |
| Flow steering valve driver | Auto firm switch LED |

3. Continue to “Pneumatic Components Diagnostic Test” on page 2-9.

## Pneumatic Components Diagnostic Test

This test is used to check that there is airflow to each of the bladders. It verifies that the air pump, switching valve, and six mattress valves are working.

Pneumatic components can be activated manually through the caregiver pendant keypad (see figure 2-1 on page 2-5). Table 2-3 on page 2-9 shows the caregiver pendant keypad/pneumatic component relationship.

**Table 2-3. Pendant Keypad/Pneumatic Component Relationship**

| Switch | Component Tested |
|---|---|
| Pressure relief switch | Head manifold valve |
| Heel 1 switch | Seat manifold valve |
| Heel 2 switch | Knee manifold valve |
| Heel 3 switch | Heel top manifold valve |
| Comfort switch | Heel middle manifold valve |
| Firmer switch | Heel bottom manifold valve |
| Softer switch | Pump |
| Auto firm switch | Flow direction valve |

**Figure 2-3. Mattress Bladders**

2

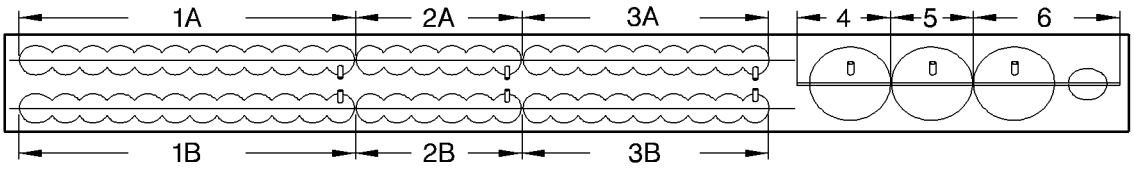



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Table 2-4 on page 2-10 shows the correlation between the bladders, valves, and sensors. The valves are connected to the left patient hoses, and the sensors are connected to the right patient hoses.

**Table 2-4. Valve/Sensor and Bladder Component Relationship**

| Valves/Sensors | Bladder |
|---|---|
| Head | 1A, 1B |
| Seat | 2A |
| Knee | 2B, 3A, 3B |
| Heel top | 4 |
| Heel middle | 5 |
| Heel bottom | 6 |

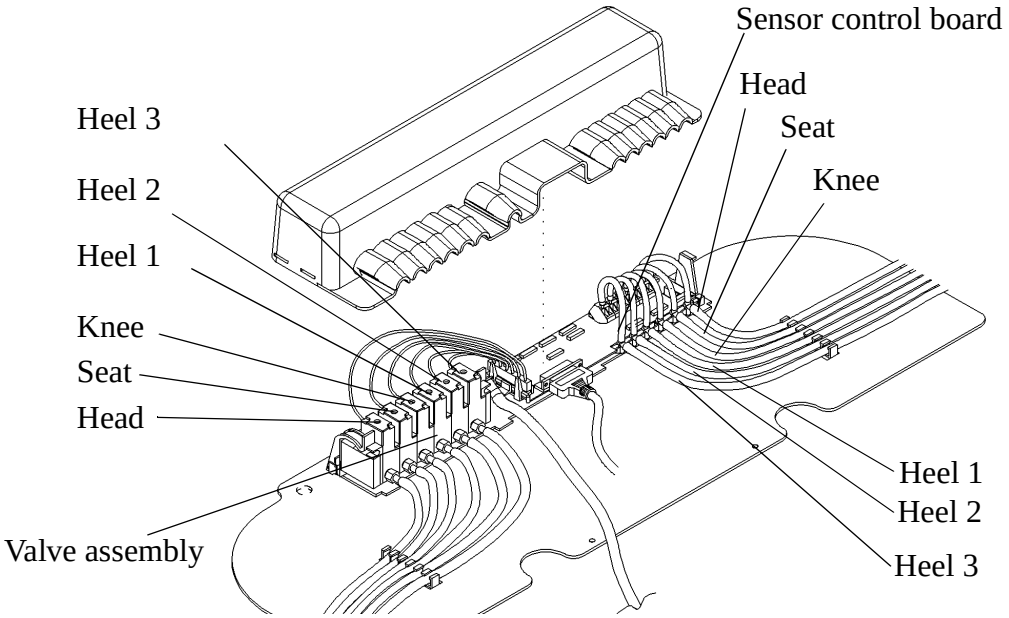
1. Press the power switch on the caregiver pendant to turn the system off. Unzip the mattress so you can see the bladders.

2. Press and hold the softer switch, press and release the auto firm switch, and press and release the pressure relief switch. The head bladders 1A and 1B deflate. All other bladders do not deflate (see figure 2-3 on page 2-10).

   **Yes** ↓

   **No** → Check the air hose connections on the head bladders 1A and 1B, the valve and sensor connection at the foot end of the mattress. Connect or replace any defective hoses (see figure 2-4 on page 2-11). Check the pump, the switching valve, and the head manifold valve for proper operation. If this corrects the problem, go to “Final Actions” on page 2-14. Otherwise, go to RAP 2.1.

**Figure 2-4. Valve\Sensor Identification**




3. Release all switches. Press and hold the softer switch, and press the pressure relief switch. Observe that the head bladders 1A and 1B inflate (see figure 2-3 on page 2-10).

   **Yes** **No**
   ↓ → Check the air hose connections on the head bladders 1A and 1B, and the valve and sensor connection at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

4. Ensure the power LED is off.

5. Press and hold the softer switch, press and release the auto firm switch, and press and release the heel 1 switch. Observe that the seat bladder 2A deflates and that all other bladders do not deflate (see figure 2-3 on page 2-10).

   **Yes** **No**
   ↓ → Check the air hose connections on the seat bladder 2A and the valve and sensor connection at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

6. Release all switches. Press and hold the softer switch, and press the heel 1 switch. Observe that the seat bladder 2A inflates (see figure 2-3 on page 2-10).

   **Yes** **No**
   ↓ → Check the air hose connections on the seat bladder 2A and the valve and sensor connection at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

7. Ensure the power LED is off.

8. Press and hold the softer switch, press and release the auto firm switch, and press and release the heel 2 switch. Observe that the knee bladders 2B, 3A, and 3B deflate and that all other bladders do not deflate (see figure 2-3 on page 2-10).

   **Yes** **No**
   ↓ → Check the air hose connections on the knee bladders 2B, 3A, and 3B and the valve and sensor connections at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

9. Release all switches. Press and hold the softer switch, and press the heel 2 switch. Observe that the knee bladders 2B, 3A, and 3B inflate (see figure 2-3 on page 2-10).

   **Yes** **No**
   ↓ → Check the air hose connections on the knee bladders 2B, 3A, and 3B and the valve and sensor connections at the foot end of the bed. Connect or replace any defective hoses (see figure 2-4 on page 2-11). If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

10. Ensure the power LED is off.

11. Press and hold the softer switch, press and release the auto firm switch, and press and release the heel 3 switch. The heel top bladder 4 deflates, and all other bladders do not deflate (see figure 2-3 on page 2-10).

    **Yes** **No**
    ↓ → Check the air hose connections on the heel top bladder 4 and the valve and sensor connections at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

12. Release all switches. Press and hold the softer switch, and press the heel 3 switch. Observe that the heel top bladder 4 inflates (see figure 2-3 on page 2-10).

    **Yes** **No**
    ↓ → Check the air hose connections on the heel top bladder 4 and the valve and sensor connections at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

13. Ensure the power LED is off.

14. Press and hold the softer switch, press and release the auto firm switch, and press and release the comfort switch. Observe that the heel middle bladder 5 deflates and that all other bladders do not deflate (see figure 2-3 on page 2-10).

    **Yes** **No**
    ↓ → Check the air hose connections on the heel middle bladder 5 and the valve and sensor connections at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

15. Release all switches. Press and hold the softer switch, and press the comfort switch. The heel middle bladder 5 inflates (see figure 2-3 on page 2-10).

    **Yes** **No**
    ↓ → Check the air hose connections on the heel middle bladder 5 and the valve and sensor connections at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

16. Ensure the power LED is off.

2

17. Press and hold the softer switch, press and release the auto firm switch, and press and release the firmer switch. Observe that the heel bottom bladder 6 deflates and that all other bladders do not deflate (see figure 2-3 on page 2-10).

    **Yes** **No**
    ↓ → Check the air hose connections on the heel bottom bladder 6 and the valve and sensor connections at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

18. Release all switches. Press and hold the softer switch and press the firmer switch. Observe that the heel bottom bladder 6 inflates (see figure 2-3 on page 2-10).

    **Yes** **No**
    ↓ → Check the air hose connections on the heel bottom bladder 6 and the valve and sensor connections at the foot end of the mattress (see figure 2-4 on page 2-11). Connect or replace any defective hoses. If this corrects the problem, go to "Final Actions" on page 2-14. Otherwise, go to RAP 2.1.

19. Go to "Final Actions" on page 2-14.

## Final Actions

1. Complete the required routine maintenance procedures. See "Preventive Maintenance" on page 6-29.

2. Ensure all components are in place and secure.

3. Complete all required administration tasks.

# 2.1 Slow Leak

## Pneumatic Subsystem



The pneumatic subsystem is comprised of the following five components:

- Bladders, both top and lower
- Hoses and hose fittings
- Air P.C. board
- Solenoid valves
- Air pump

When isolating the fault to one component in the pneumatic subsystem:

- Ensure that all cables and air hoses are connected properly.
- Check all coupling and o-rings for signs of damage.
- Perform the “Pneumatic Components Diagnostic Test” on page 2-9.

**NOTE:**
If the service required LED is on, you must reset the air system before you can start troubleshooting. To do this, turn the air system power switch off, then back on.

1. Press the caregiver pendant power switch. Put the system in the auto firm mode. Feel around the mattress air hose connections and down the length of the air hose. Leaks are detected.

   **Yes** **No**
   ↓ → Go to step 4.

2. Replace leaking air hoses.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 4.

3. Go to “Final Actions” on page 2-14.

4. Open the mattress and feel for holes in the bladders and seams. Leaks are detected.

   **Yes** **No**
   ↓ → Go to step 7.

2

5. Replace leaking bladder.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 7.

6. Go to “Final Actions” on page 2-14.

7. Unplug the bed and the power unit from their power source.

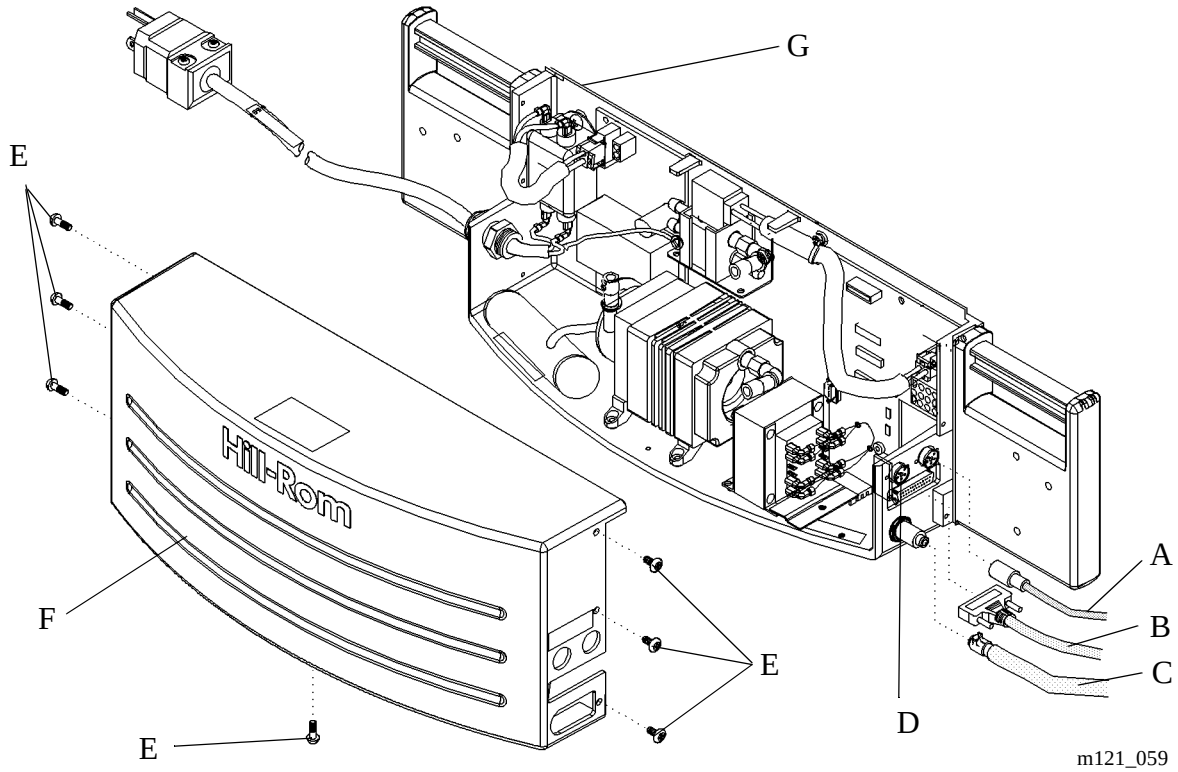
**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

8. Disconnect the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 2-5 on page 2-17).

2

**Figure 2-5. Power Unit**




9. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power unit housing (G).

10. Connect the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) to the power unit assembly.

11. Plug the power unit cord into an appropriate power source, and press the power button on the caregiver pendant. Put the system in the auto firm mode. Check the air pump hoses for leaks. Leaks are detected.

    **Yes** **No**
    ↓ → Go to step 14.

12. Replace leaking air hoses.

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 14.

13. Go to “Final Actions” on page 2-14.

2

14. Check the air board connector for proper connection. The air board is connected properly.

    **Yes** **No**
    ↓ → Connect the air board connector. If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 15.

15. Replace the sensor control valve assembly (refer to procedure 4.3).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 17.

16. Go to "Final Actions" on page 2-14.

17. Replace the sensor control board (refer to procedure 4.2).

    This solves the problem.

    **Yes** **No**
    ↓ → Call Hill-Rom Technical Support at (800) 445-3720.

18. Go to "Final Actions" on page 2-14.

## 2.2 Continuous Run



**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

1. Check the mattress for pinched or disconnected air hoses. Pinched or disconnected air hoses are found.

   **Yes** **No**
   ↓ → Go to step 4.

2. Replace pinched or connect disconnected hoses.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 4.

3. Go to “Final Actions” on page 2-14.

4. Check for large holes in the mattress main bladder and heel bladder. Holes are found.

   **Yes** **No**
   ↓ → Go to step 7.

5. Replace the defective bladder.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 7.

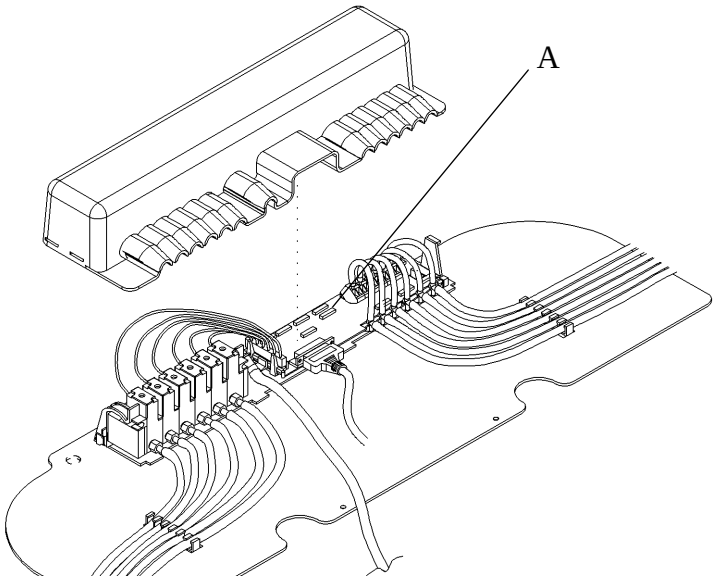
6. Go to “Final Actions” on page 2-14.

7. Check pins and properly seated connector on the sensor control board (A). Bent or missing pins are found (see figure 2-6 on page 2-20).

   **Yes** **No**
   ↓ → Go to step 10.

2

**Figure 2-6. Sensor Control Board**

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8. Replace the mattress cable (refer to procedure 4.4).

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 10.

9. Go to “Final Actions” on page 2-14.

10. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 12.

11. Go to “Final Actions” on page 2-14.

12. Replace the sensor control board (refer to procedure 4.2).

    This solves the problem.

    **Yes** **No**
    ↓ → Call Hill-Rom Technical Support at (800) 445-3720.

13. Go to “Final Actions” on page 2-14.

## 2.3 Triac Short



**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

1. Replace the air control board (refer to procedure 4.7).

   This solves the problem.

   **Yes** **No**
   ↓ → Call Hill-Rom Technical Support at (800) 445-3720.

2. Go to “Final Actions” on page 2-14.

## 2.4 Sensor EEPROM

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

1. Remove the surface control module cover. Disconnect the mattress cable from the sensor board and from the power unit assembly. Inspect both mattress cable connectors for bent, recessed, or missing pins. Pins are bent, recessed, or missing.

   **Yes** **No**
   ↓ → Go to step 4.

2. Replace the mattress cable (refer to procedure 4.4).

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 5.

3. Go to “Final Actions” on page 2-14.

4. Check the mattress cable for continuity. Continuity exists.

   **Yes** **No**
   ↓ → Replace the mattress cable (refer to procedure 4.4). If this solves the problem, go to “Final Actions” on page 2-14. Otherwise, go to step 7.

5. Connect the mattress cable to the sensor board and to the power unit. Press the power switch on the caregiver pendant.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 7.

6. Go to “Final Actions” on page 2-14.

7. Replace the air control board (refer to procedure 4.7).

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 9.

8. Go to “Final Actions” on page 2-14.

9. Replace the sensor board (refer to procedure 4.2).

   This solves the problem.

   **Yes** **No**
   ↓ → Call Hill-Rom Technical Support at (800) 445-3720.

10. Go to “Final Actions” on page 2-14.

## 2.5 Mattress Disconnect

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

1. Remove the surface control module cover. Disconnect the mattress cable from the sensor board and from the power unit assembly. Inspect both mattress cable connectors for bent, recessed, or missing pins. Pins are bent, recessed, or missing.

   **Yes** **No**
   ↓ → Go to step 4.

2. Replace the mattress cable (refer to procedure 4.4).

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 5.

3. Go to "Final Actions" on page 2-14.

**CAUTION:**
Refer to your voltage meter owner's manual for complete and detailed information regarding the operation of your voltage ohm meter (VOM).

4. Check the mattress cable for continuity. Continuity exists.

   **Yes** **No**
   ↓ → Replace the mattress cable (refer to procedure 4.4). If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 7.

5. Connect the mattress cable to the sensor board and to the power unit. Press the power switch on the caregiver pendant.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 7.

6. Go to “Final Actions” on page 2-14.

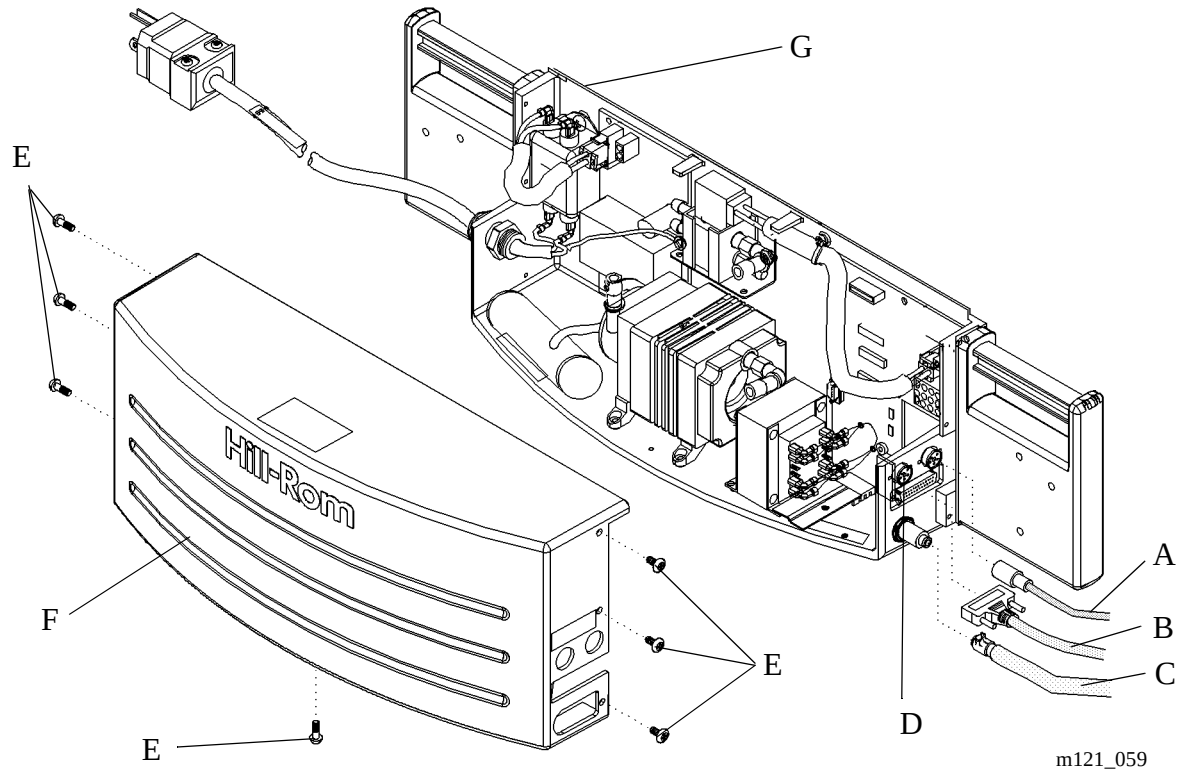
7. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

8. Disconnect the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 2-7 on page 2-25).

**Figure 2-7. Power Unit**




9. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power unit housing (G).

2

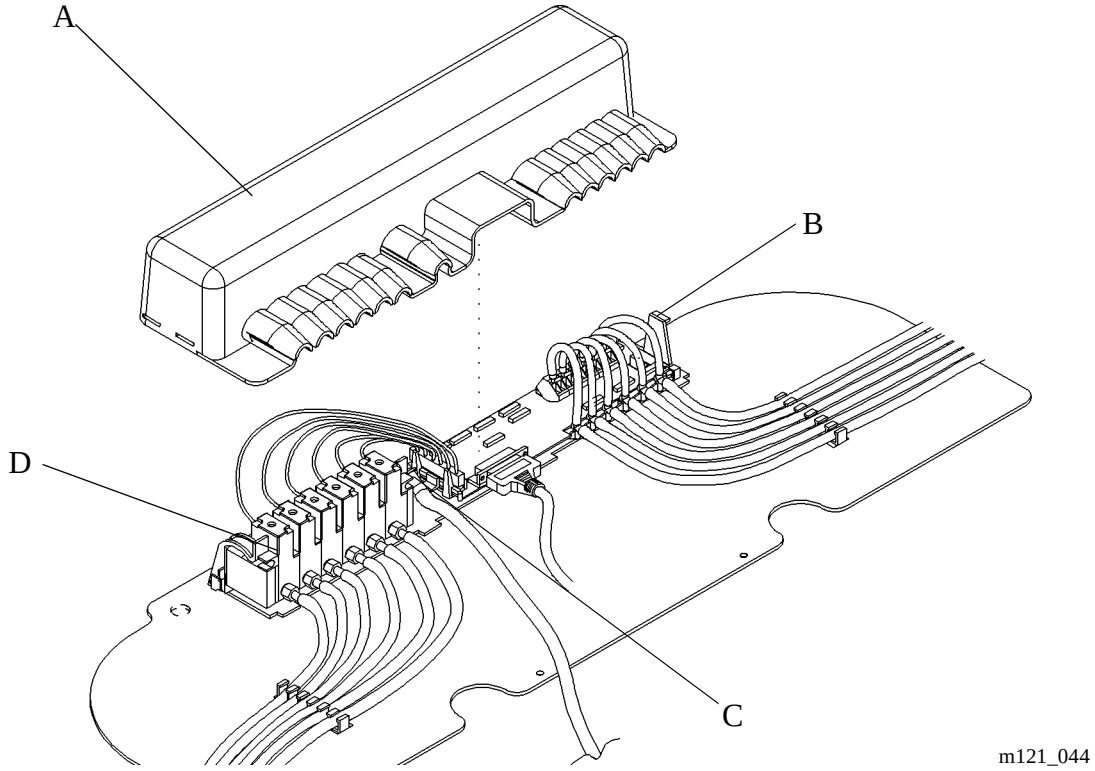
10. Connect the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) to the power unit assembly.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

11. Remove the foot panel from the bed.

12. Unzip the mattress to gain access to the components in the foot end of the mattress (see figure 2-8 on page 2-26).

**Figure 2-8. Mattress Air Tube Replacement**




13. Remove the surface control cover (A) from the surface control frame (B).

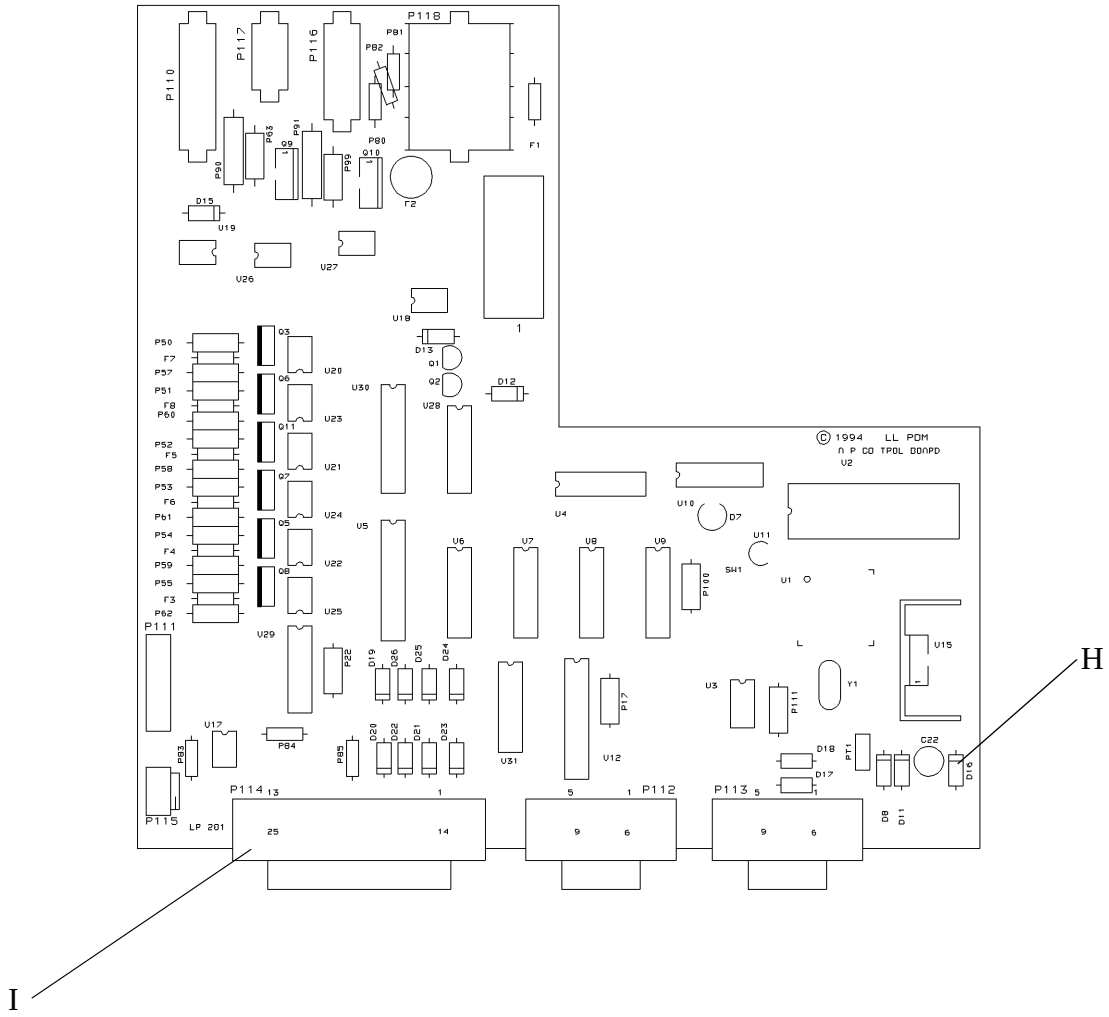
**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

14. Connect the negative lead of the voltmeter to the anode (end without line) of D16 (H) located on the air control board (see figure 2-9 on page 2-27). Prepare to take two voltage measurements quickly. Initiate self diagnostics "Caregiver Pendant Diagnostic Test" on page 2-7. Connect the positive lead of voltmeter to pin 1, on P114 (I). The DC voltage is greater than 8V DC.

**Yes** **No**

↓ → Replace the air control board (refer to procedure 4.7). If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 16.

**Figure 2-9. Air Control Board**

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2

15. Put the positive lead on pin 13, on P114 (I). The voltage is greater than 4V DC.

    **Yes** **No**
    ↓ → Go to step 18.

16. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 18.

17. Go to "Final Actions" on page 2-14.

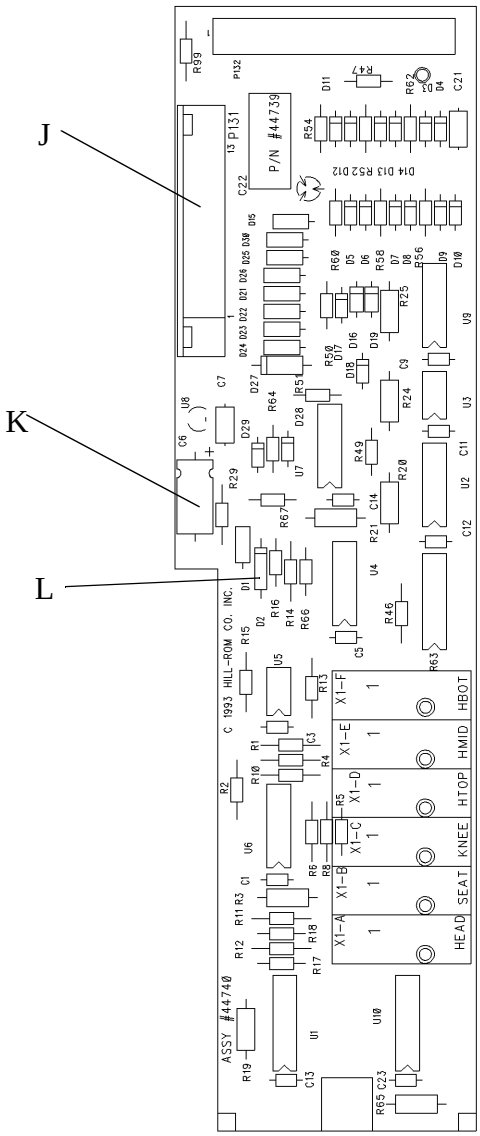
**CAUTION:**
Refer to your voltage meter owner's manual for complete and detailed information regarding the operation of your VOM.

18. Connect the negative lead of the voltmeter to the negative lead of C6 (K) on the sensor board (see figure 2-10 on page 2-29). Prepare to take two voltage measurements. Initiate self diagnostics (see "Caregiver Pendant Diagnostic Test" on page 2-7). Connect the positive lead of the voltmeter to the cathode (end with line) of D2 (L). The DC voltage is greater than 8V DC.

    **Yes** **No**
    ↓ → Check the mattress cable for continuity. Replace the cable if required (refer to procedure 4.4). If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 19.

2

**Figure 2-10. Sensor Control Board**

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19. Put the positive lead on pin 13, on P131 (L). The voltage is greater than 4V DC.

**Yes** **No**

↓ → Replace the mattress sensor control board (refer to procedure 4.2). If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 20.

20. Check the mattress cable for continuity. Continuity exists.

| Yes | No |
|---|---|
| ↓ | → Replace the cable if required (refer to procedure 4.4). If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 21. |

21. Call Hill-Rom Technical Support at (800) 445-3720.

## 2.6 Triac Open

1. Disconnect the mattress cable (B) from the power unit (see figure 2-11 on page 2-32).

2. Perform “Valve Driver Diagnostic Test” on page 2-8. Only the first six LEDs are flashing.

   **Yes** **No**
   ↓ → Go to step 14.

3. Unplug the bed and the power unit from their power source.

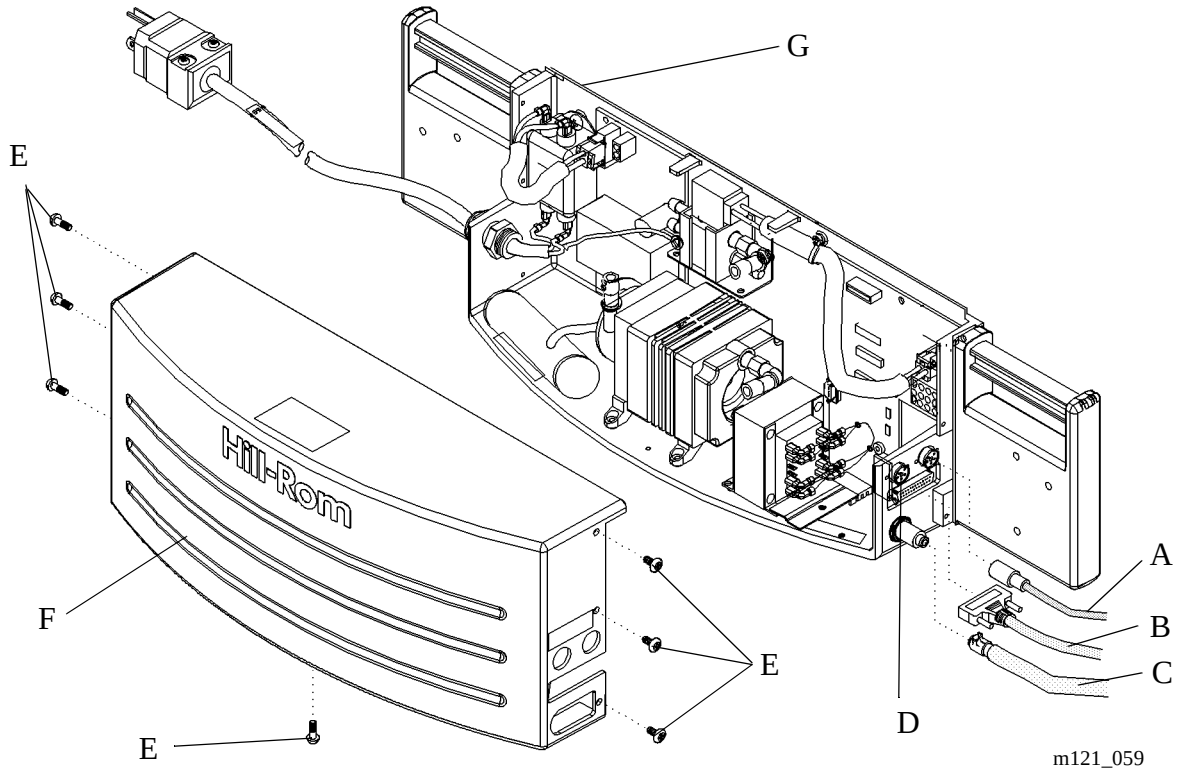
**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

4. Disconnect the caregiver pendant connector (A), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly.

2

**Figure 2-11. Power Unit**




5. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power unit housing (G).

6. Connect the caregiver pendant connector (A), the mattress air hose (C), and the patient pendant connector (D) (optional) to the power unit assembly.

7. Disconnect and inspect the transformer wiring assembly. Repair any broken or damaged wires. Connect the transformer wiring assembly connector P118 to the air control board (see figure 2-12 on page 2-33). Perform “Valve Driver Diagnostic Test” on page 2-8. Only the first six LEDs are flashing.

   **Yes** **No**
   ↓ → Go to “Final Actions” on page 2-14.

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**Figure 2-12. Block Diagram**

2

Refer to fold-out 3-2 at the rear of this manual.

2

8.

9. Measure the AC voltage between pins 3 and 12 on P118 (see figure 2-12 on page 2-33). The voltage is greater than 20V AC.

   **Yes** **No**
   ↓ → Go to step 11.

10. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 28.

11. Go to “Final Actions” on page 2-14.

12. Measure the AC voltage between pins 10 and 1 on P118 (see figure 2-12 on page 2-33). The voltage is greater than 100V AC.

    **Yes** **No**
    ↓ → Replace fuse F2 on the air control board. If this solves the problem, go to “Final Actions” on page 2-14. Otherwise, go to step 12.

13. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 28.

14. Go to “Final Actions” on page 2-14.

15. The last two LEDS are flashing.

    **Yes** **No**
    ↓ → Go to step 17.

16. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 17.

17. Go to “Final Actions” on page 2-14.

18. All eight LEDs are flashing.

**Yes** **No**
↓ → Replace the air control board (refer to procedure 4.7). If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 28.

19. Disconnect and inspect the power supply/air board wiring assembly. Repair any broken or damaged wires. Connect the power supply/air board wiring assembly to P110 on the air control board and to the power supply board (see figure 2-12 on page 2-33). Perform "Valve Driver Diagnostic Test" on page 2-8. All eight LEDs are flashing.

**Yes** **No**
↓ → Go to "Final Actions" on page 2-14.

20. Measure AC voltage between pin 1 and 2 on P110 (see figure 2-12 on page 2-33). The voltage is greater than 100V AC.

**Yes** **No**
↓ → Go to step 22.

21. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

**Yes** **No**
↓ → Go to step 28.

22. Go to "Final Actions" on page 2-14.

23. Measure the AC voltage between pin 1 and 2 on P101 located on the power supply board (see figure 2-12 on page 2-33). The voltage is greater than 100V AC.

**Yes** **No**
↓ → Go to step 25.

24. Replace the power supply/air board wiring assembly.

    This solves the problem.

**Yes** **No**
↓ → Go to step 28.

25. Go to "Final Actions" on page 2-14.

26. Measure the AC voltage between pin 1 and 2 on P28 located on the power supply board (see figure 2-12 on page 2-33). The voltage is greater than 100V AC.

2

**Yes** **No**
↓ → Check the line filter connections, the power plug connections, and the power source. If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 28.

27. Replace the power supply board (refer to procedure 4.6).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 28.

28. Go to "Final Actions" on page 2-14.

29. Call Hill-Rom Technical Support at (800) 445-3720.

## 2.7 LON Communication Error

1. Inspect the caregiver pendant cable for cuts, pinched, or broken wires. Cuts, pinched, or broken wires are found.

   **Yes** **No**
   ↓ → Go to step 4.

2. Repair or replace the caregiver pendant cable (refer to procedure 4.13).

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 4.

3. Go to “Final Actions” on page 2-14.

4. Inspect for broken, bent, or missing pins on the caregiver pendant connector J120 and at P120 on the power unit assembly. Broken, bent, or missing pins are found.

   **Yes** **No**
   ↓ → Go to step 7.

5. Repair or replace the broken, bent, or missing pins.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 7.

6. Go to “Final Actions” on page 2-14.

7. Disconnect the caregiver pendant from the power unit, and connect a known good caregiver pendant to the power unit.

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 10.

8. Replace the caregiver pendant board (refer to procedure 4.13).

   This solves the problem.

   **Yes** **No**
   ↓ → Replace the caregiver pendant cable (refer to procedure 4.13). If this solves the problem, go to “Final Actions” on page 2-14. Otherwise, go to step 10.

9. Go to “Final Actions” on page 2-14.
10. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

    **Yes** **No**
    ↓ → Call Hill-Rom Technical Support at (800) 445-3720.

11. Go to “Final Actions” on page 2-14.

## 2.8 Key Stuck Closed

1. Replace the caregiver pendant board (refer to procedure 4.13).

   This solves the problem.

   **Yes** **No**
   ↓ → Call Hill-Rom Technical Support at (800) 445-3720.

2. Go to “Final Actions” on page 2-14.

## 2.9 ZoneAire Sleep Surface System Does Not Work

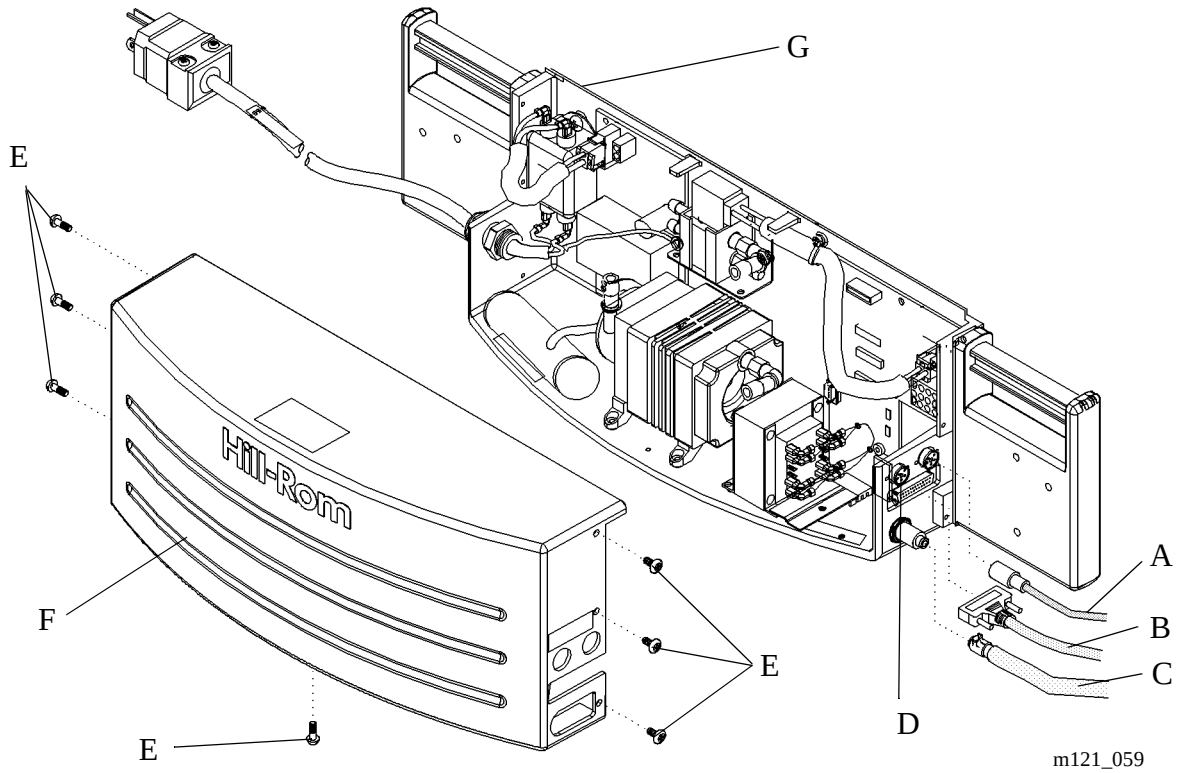
1. Unplug the power unit from its power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Disconnect the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 2-13 on page 2-40).

**Figure 2-13. Power Unit**




3. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power unit housing (G).

4. Connect the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) to the power unit assembly.

5. Plug the power unit cord into an appropriate power source. The mains power LED comes on.

   **Yes** **No**
   ↓ → Measure the voltage at pin 2 and pin 5 on P120. If the voltage is greater than 10V DC, replace the caregiver pendant board or cable. Otherwise, go to step 6.

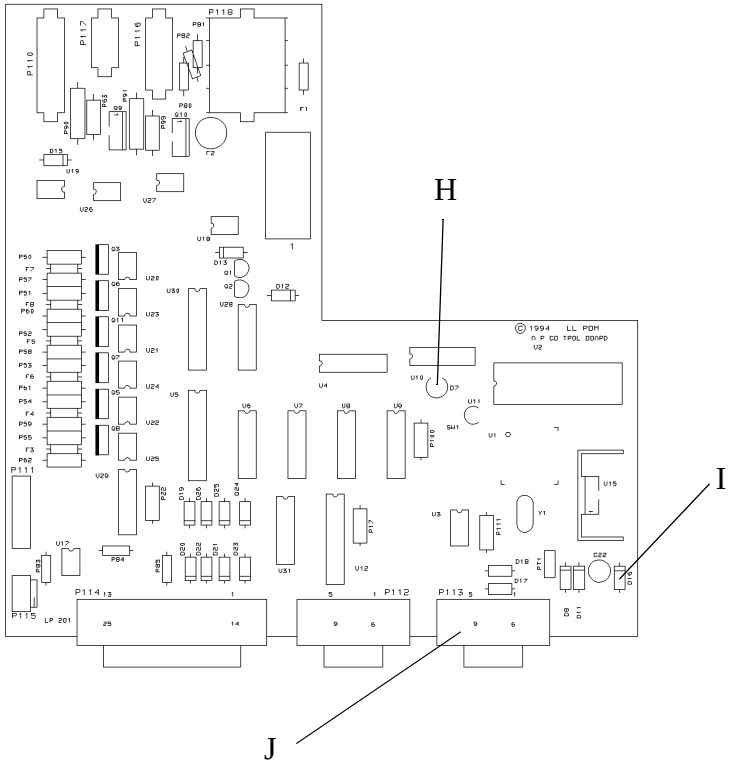
6. Press the power button on the caregiver pendant.

7. The LED D7 (H) on the air control board is on or flashing (see figure 2-14 on page 2-42).

   **Yes** **No**
   ↓ → Go to step 9.

**NOTE:**
When power is first applied, D7 will flash one time if the board is ok.

**Figure 2-14. Air Control Board**

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8. Replace the air control board (refer to procedure 4.7).

   This solves the problem.

   **Yes** **No**
   ↓ → Go to step 9.

9. Go to "Final Actions" on page 2-14.

10. Connect the negative lead of the voltmeter to the anode (end with out line) of D16 (I) located on the air control board. Connect the positive lead of the voltmeter to pin 2, on P113 (J). The DC voltage is greater than 8V DC.

    **Yes** **No**
    ↓ → Go to step 13.

11. Replace the air control board (refer to procedure 4.7).

    This solves the problem.

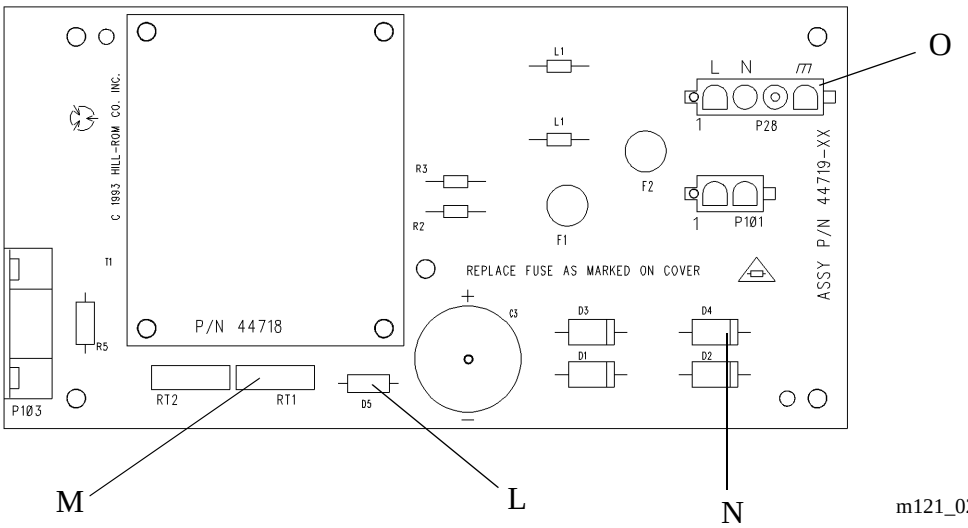
    **Yes** **No**
    ↓ → Go to step 13.

12. Go to “Final Actions” on page 2-14.

13. Measure the AC voltage at pins 1 and 2 on P28 (O) located on the power supply board (see figure 2-15 on page 2-43). The voltage is greater than 100V AC.

    **Yes** **No**
    ↓ → Replace the power supply board, (refer to procedure 4.6). If this solves the problem, go to “Final Actions” on page 2-14. Otherwise, go to step 18.

**Figure 2-15. Power Supply Board**




14. Measure the DC voltage across D5 (L) on the power supply board. The voltage is greater than 8V DC.

    **Yes** **No**
    ↓ → Go to step 17.

15. Replace the caregiver pendant wiring assembly (P/N 46936).

    This solves the problem.

    **Yes** **No**
    ↓ → Go to step 18.

16. Go to “Final Actions” on page 2-14.

2

17. Measure the AC voltage at the anode (end without line) of D4 (N) and RT1(M) pin 1 located on the power supply board. The voltage is greater than 6V AC.

    **Yes** **No**
    ↓ → Replace the power supply board (refer to procedure 4.6). If this solves the problem, go to "Final Actions" on page 2-14. Otherwise, go to step 18.

18. Call Hill-Rom Technical Support at (800) 445-3720.

# Chapter 3
# Theory of Operation

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3

**NOTES:**

## Schematics

**Figure 3-1. ZoneAire Sleep Surface System Wiring Diagram**



Refer to fold-out FO3-1 at the rear of this manual.

**Figure 3-2. Power Unit Block Diagram**



Refer to fold-out FO 3-2 at the rear of this manual.

**Figure 3-3. Caregiver Pendant Schematic Diagram**



Refer to fold-out FO3-3 at the the rear of this manual.

**Figure 3-4. Power Supply Schematic Diagram**



Refer to fold-out FO3-4 at the rear of this manual.

**Figure 3-5. Air Control Board (Sheet 1 of 3)**



Refer to fold-out FO3-5.1 at the rear of this manual.

**Figure 3-6. Air Control Board (Sheet 2 of 3)**



Refer to fold-out FO3-5.2 at the rear of this manual.

**Figure 3-7. Air Control Board (Sheet 3 of 3)**



Refer to fold-out FO3-5.3 at the rear of this manual.

**Figure 3-8. Sensor Board Schematic Diagram**



Refer to fold-out FO3-6 at the rear of this manual.

# Software Theory of Operation

## Air Control Board

### General Description

The ZoneAire Sleep Surface System is an air inflated, multi-functional, automatic and/or user controlled sleep surface used in conjunction with hospital patient beds. The system functions are separated into several modes of operation.

The pressure relief mode is designed to minimize and uniformly distribute interface pressures between a patient and their mattress.

The comfort mode allows users to manually adjust the air pressures to their desired level.

Three heel relief modes further reduce heel-to-mattress interface pressure and can accommodate a wide range of patient heights.

The auto firm mode inflates the mattress to a high pressure to aid in transfer of patients to and from the bed.

Software algorithms are included to provide limited self diagnostics to reduce the probability of unknowingly operating in a degraded state and/or reduce durability of components. Software algorithms, which can be activated through the caregiver pendant, are also included to aid in troubleshooting.

Communications between the controller circuit and the caregiver pendant are via LON communications protocol through a single pair of wires utilizing RS485 medium standard. Communications between the controller circuit and the pressure sensing circuit are via a 25 pin D-sub cable utilizing 3-wire synchronous serial bi-directional communications along with other discrete lines and AC and DC power.

Essentially all intelligent communications and control are performed by the controller circuit. This document is intended to describe the operation of the software, internal to the controller circuit, that provides this intelligence. While the concentration is on software, this description should provide a better understanding of operation of the entire system.

## Reset

A reset can happen two ways. A reset is initiated when power is applied to the NEURON micro controller, and when a Neuron watchdog timer expires.

Upon reset, the following sequence occurs:

- The operating mode is read from the NEURON's internal EEPROM. This is the state the air system was in before the reset occurred.
- Relay is turned on. This supplies power to the pressure sensing circuit located in the mattress. It also supplies 24V AC power to the manifold valve assembly drive circuitry.
- Messages are sent to the caregiver pendant to light the appropriate LEDs.
- Any errors present are cleared.
- The sensor calibration constants are read from the EEPROM located on the pressure sensor circuit. These constants are stored in multiple locations. If these multiple locations are not consistent, an error is set.
- The present pressure is read and stored for reference for use in the comfort mode.
- Normal operating sequence is initiated in the appropriate mode.

## Operating Modes

The air system operates in one of the following seven possible modes:

- Off
- Pressure management
- Heel management 1
- Heel management 2
- Heel management 3
- Comfort
- Auto firm

In all seven modes, the caregiver pendant is monitored for activity pertaining to the air system. In all modes, except the off mode, a main loop is executed at an approximate 25 Hz rate that performs the following functions:

- Executes pressure regulation/control in the appropriate air system mode
- Performs a D/A conversion to calibrate each sensor prior to A/D conversion
- Performs A/D conversion on each pressure sensor
- Monitors electrical connection between the control circuit board and the pressure sensing circuit board
- Monitors patient pendant input
- Monitors the driver circuits for the air pump and each valve for proper output



Some operating modes have a mode memory feature. With this feature, the system can return to the previous operating mode by pressing the present mode's switch (i.e. toggle from the present mode back to the previous mode). For example, suppose a transition is made to the auto firm mode from the comfort mode. By pressing the auto firm switch, a transition will be made back to the comfort mode and user defined pressure trim points (defined below) are restored. The modes with this mode memory feature are:

- Heel relief_1 mode
- Heel relief_2 mode
- Heel relief_3 mode
- Auto firm mode

### Off Mode

While in the off mode:

- The relay is opened.
- Other outputs are cleared.
- Hardware watchdog is refreshed (unless disabled by LON explicit message code 0x01 for testing during manufacture).
- All air system caregiver pendant activity is monitored.
- All air system LEDs except mains power are off.
- No pressure regulation is performed.

The transition to the off mode can be initiated two ways:

- Pressing the sleep surface power switch while in any of the other six modes.
- An air system error occurs with exception of a communication error. Can occur while in any of the other six modes.

### Pressure Relief Mode

While in the pressure relief mode, the air pressures in each of the six zones are regulated at predefined levels, called trim points. Around each of the trim points is a “band” which provides a pressure tolerance and creates a pressure hysteresis. If no correction in pressure is taking place, the band is used as the reference.



Transition to the pressure relief mode can be made by:

- Pressing the sleep surface power switch while in the off mode.
- Pressing the pressure relief switch while in any other mode except off mode.
- Pressing heel relief 1 switch while in the heel relief 1 mode.
- Pressing heel relief 2 switch while in the heel relief 2 mode.
- Pressing heel relief 3 switch while in the heel relief 3 mode.
- Pressing the auto firm switch while in the auto firm mode only if the auto firm mode was initiated from the pressure relief mode (mode memory feature).
- Removing the patient pendant while in comfort mode.

The following caregiver pendant LEDs are lit:

- Sleep surface power LED
- Pressure relief LED

### Heel Relief Modes

While in a heel relief mode, certain zones are deflated to near zero pressure depending on which heel relief mode is selected. Pressures are then regulated, as described in the pressure relief mode above, at predefined trim points.

Upon entering a heel relief mode, a 10 minute timer is started. When this timer expires, the deflated heel zones are inflated to a higher, reliably readable, pressure then immediately deflated back to the trim points defined above.

Transition to a heel relief mode can be made by:

- Pressing the respective heel relief switch (heel relief switch 1, 2, or 3) while in the pressure relief mode.
- Pressing the respective heel relief switch (heel relief switch 1, 2, or 3) while in either of the other two heel relief modes.

The following caregiver pendant LEDs are lit:

- Sleep surface power LED
- Pressure relief LED
- Heel relief 1, 2, or 3 LED



### Comfort Mode

While in the comfort mode, the pressures in the six zones can be set manually in two ways:

- With the patient pendant firm, soft controls
- With caregiver pendant firmer, softer controls if the patient pendant is present

When inflating manually, all six air manifold valves are opened, effectively tying all zones together as one air volume, the air pump is turned on, and the flow direction valve is off (flow is into mattress).

When deflating manually, all six air manifold valves are opened, effectively tying all zones together as one air volume, the air pump is turned on, and the flow direction valve is on (flow is out of mattress).

A manifold valve excessive use algorithm is incorporated to prevent unreasonable stress on the pump and valve components due to extensive user activation in the Comfort mode. While in this mode, a “duty cycle” counter is used to determine excessive use. Whenever the mattress manifold valves are activated by the user, whether from the caregiver pendant or the patient pendant, this counter is incremented. Whenever the valves are not activated by the user, the counter is decremented (limited at zero). The counter is also decremented during normal pressure regulation and while the valves are off due to the user exceeding the maximum and minimum limits as described above. If this counter ever accumulates to more than approximately 10 minutes, manual activation is disabled for approximately 10 minutes.

Transition to the comfort mode can be made by:

- Pressing the comfort switch while in any other mode except off mode, if patient pendant is present.
- Pressing the auto firm switch while in the auto firm mode provided the auto firm mode was initiated from the comfort mode (mode memory feature).

While in the Comfort mode, the following caregiver pendant LEDs are lit:

- Sleep surface power LED
- Comfort LED
- Firmer LED (only when inflating using caregiver pendant)
- Softer LED (only when deflating using caregiver pendant)



### Auto Firm Mode

While in the auto firm mode, all trim points are changed to new values. Pressures are then regulated, as described in the pressure relief mode above, at the new trim points. When entering this mode, a 60 minute timer is started. If this timer expires before the system is placed in a different mode, the system with automatically return to the previous mode.

Transition to the auto firm mode can be made by pressing the auto firm switch while in any other mode except off mode.

The following caregiver pendant LEDs are lit:

- Sleep surface power LED
- Auto firm LED

### Mode Transition

### Power Up

By design, the system always powers up in the pressure relief mode. This is accomplished by pressing the caregiver pendant sleep surface power switch while in the off mode.

During transition from the off mode to the pressure relief mode, the following occurs:

- The low voltage AC/mattress power relay is activated and all I/O is initialized.
- Any and all errors are cleared.
- All timers and counters are initialized.
- Proper caregiver pendant LEDs are lit.
- New mode (pressure relief mode) is stored in on-chip EEPROM.
- Calibrations are read from pressure sensing circuit EEPROM and pressure trim points are calculated.
- Pressure out-of-range delay timers are defeated to allow immediate correction.
- Pressure tolerance bands around the trim points are calculated.



### Intermode Transitions

Intermode transitions are transitions between all modes except the off mode. Upon transition into one of these new modes, the following occurs:

- Pressure bands around the new mode's trim points are calculated.
- Pressure out-of-range delay timers are defeated to allow immediate correction to the new trim points.
- Appropriate timers and counters are initialized.
- Proper caregiver pendant LEDs are lit.
- New mode is stored in on-chip EEPROM.

### Power Down

A transition to the off mode, either manually or because of a system error, initiates a power down. Upon power down, the following occurs:

- All outputs, including the relay, are disabled.
- The new mode (off mode) is stored in on-chip EEPROM.
- All air system related caregiver pendant LEDs are turned off. If the transition to off mode is due to a system error, the caregiver pendant service required LED will flash a code.

## System Errors

The controller has built in self diagnostics that are designed to detect system failures that may not be easily identifiable otherwise. These failures will cause the system to transfer to the off mode and repeatedly flash a code on the caregiver pendant service required LED.

For the ZoneAire Sleep Surface System, the code consists of a certain number, N, of short flashes which identifies which error has occurred on the system. The code is continually repeated with a long pause separating repeats.



## Slow Leak Error

In all modes, except the off mode, the system is periodically (every 5 minutes) checked for slow air leaks. A slow leak is defined as a leak that is small enough for the pump to reinflate to the proper pressure but large enough to cause the system to correct too often.

To detect small leaks, a counter is incremented whenever an inflate sequence occurs and is cleared whenever a deflate sequence occurs. This counter represents the number of inflates without a deflate. An exception to this is manual inflates while in the comfort mode. Manual inflates do not increment the counter, manual deflates clear the counter.

When the 5 minute timer expires, the number of inflates without a deflate is checked for being greater than 20. If this number is greater than 20, a slow leak error is flagged, the operating mode transitions to off, and the caregiver pendant service required LED repeatedly flashes code 1. If it is less than or equal to 20, the counter is cleared and the 5 minute timer is restarted.

The ability to detect a slow leak error is much greater in the auto firm mode where the pressures are much higher and therefore, leak more. Should one need to troubleshoot a system with this error, they should do so while in the auto firm mode.

### Continuous Run Error

In all modes, except the off mode, the system is monitored for failure conditions that would cause the pump to be commanded, by the control algorithm, to run continuously. Examples of these are:

- Excessive air leaks
- Faulty pump
- Faulty air manifold or flow direction valve
- Faulty pressure sensor or sensor circuit
- Faulty control circuit
- Loss of AC power or blown fuse
- Open or pinched hose
- Mattress connector not seated properly

If the pump runs continuously for approximately 10 minutes, in either an inflate or deflate sequence, a continuous run error is flagged, the operating mode transitions to off, and the caregiver pendant service required LED repeatedly flashes code 2.

### Triac Short Error

In all modes, except the off mode, the system is repeatedly checked for control circuit failure that would cause an air manifold valve, the flow direction valve, or the pump to be wrongly activated.

Whenever the system is not correcting pressures, the feedbacks from the triac drive circuits are monitored. If any feedback indicates an activated drive circuit continuously for 5 seconds, a triac short error is flagged, the operating mode transitions to off, and the caregiver pendant service required LED repeatedly flashes code 3.

### EEPROM Error

Upon reset and during power up (transition from the off mode to pressure relief mode), the calibrations read from the pressure sensing circuit EEPROM are checked for validity. Each calibration constant is stored in four locations to aid in determining if there is an error. The circuit will also detect faulty readings due to shorted or open communications lines between the control circuit and the pressure sensing circuit.

Whenever an EEPROM error is detected, the operating mode transitions to off, and the caregiver pendant service required LED repeatedly flashes code 4.

### Mattress Connection Error

In all modes, except the off mode, the electrical connection between the control circuit and the pressure sensing circuit is monitored. Also, prior to reading the calibrations from EEPROM (at reset and power up), the connection is checked. The control circuit checks this connection by sampling the pressure sensing circuit voltage feedback routed through the mattress cable.



The mattress connection error is set by any of two situations:

- Feedback indicates disconnection continuously for 100 samples (approximately 5 seconds).
- Prior to reading EEPROM, the feedback indicates a disconnection.

Whenever a mattress connection error is detected, the operating mode transitions to off, and the caregiver pendant service required repeatedly flashes code 5.

### Triac Open Error

In all modes, except the off mode, the system is repeatedly checked for control circuit failure that would prevent an air manifold valve, the flow direction valve, or the pump to be activated when commanded to.

Whenever the system is correcting pressures, the feedbacks from the triac drive circuits are monitored. If any feedback indicates that a drive circuit is not activated continuously for 5 seconds, a triac open error is flagged, the operating mode transitions to off, and the caregiver pendant service required LED repeatedly flashes code 6.

### LON Communication Error

In all modes, except the off mode, communications with the caregiver pendant is checked. The ZoneAire Sleep Surface System gets updates, via LON communications, from the caregiver pendant at most every 30 seconds. The ZoneAire Sleep Surface System refreshes a 5 minute timer whenever it gets this update. Should this timer ever expire, a LON communication error is flagged and the operating mode remains the same as the mode before the error occurred. A message is sent to the caregiver pendant to flash the service required LED for code 7. Of course, chances are that the caregiver pendant will not get this message. However, the caregiver pendant is also checking

communications and should discover that communication was lost. It will then flash code 7.

## Diagnostic Routines

### Component Manual Activation

While in the off mode, operation of the relay, air manifold valves, flow direction valve, and pump can be tested. The test consists of simultaneously pressing the Softer switch and the appropriate air system component switches, then verifying operation either visually, audibly, or with the appropriate test equipment. The switch LED corresponding to the component activated will flash at 2 Hz. As long as the Softer switch remains pressed, the pump or valve will remain activated so that additional components can be activated as well.

The relay and pump will activate whenever the softer switch is pressed regardless of whether another switch is pressed. The corresponding air system component switches are:

- Head manifold valve --- pressure relief switch
- Seat manifold valve --- heel relief_1 switch
- Knee manifold valve --- heel relief_2 switch
- Heel top manifold valve --- heel relief_3 switch
- Heel middle manifold valve --- comfort switch
- Heel bottom manifold valve --- firmer switch
- Pump --- softer switch
- Flow direction valve --- auto firm switch

### Driver Circuit Self Test

While in the off mode, operation of the drive circuitry for the air manifold valves, flow direction valve, and pump can be tested. This tests only for power being switched to each valve/pump component (fuse blown?). It does not test for current flow through any valve/pump components.

The test is initiated by simultaneously pressing and holding, for 5 seconds, the pressure relief and auto firm switches. While the test is being performed, the sleep surface power LED flashes and the caregiver pendant LED associated with that component (see below) flashes. When the test is complete, the caregiver pendant LEDs associated with each drive circuit will either light steady or flash. Circuits that pass will light their respective LED steady for 5 seconds. The circuits that fail will flash their respective LED for 5 seconds.

The drive circuits' respective LEDs are:

- Head manifold valve drive circuit --- pressure relief LED
- Seat manifold valve drive circuit --- heel relief 1 LED
- Knee manifold valve drive circuit --- heel relief 2 LED
- Heel top manifold valve drive circuit --- heel relief 3 LED
- Heel middle manifold valve drive circuit --- comfort LED
- Heel bottom manifold valve drive circuit --- firmer LED
- Pump drive circuit --- softer LED
- Flow direction valve drive circuit --- auto firm LED

3

# Hardware Theory of Operation

## Power Supply

This supply is provides logic power to the ZoneAire Sleep Surface System air control board (44760xx), sensor control board assembly (44740), caregiver pendant, and other future upgrades. One central supply allows several nodes or logic boards to power up at nearly the same time.

AC input power is applied to connector P28.

**WARNING:**
Fuse, F2, (T, 2.0A, 250V, IEC127-3) provides protection for the power supply and the air module.

L1, C1, and C2 filter differential line transients.

Connector, P101, is the AC power output to the air module.

Resistor, R1, is currently not used in this assembly. It may be used if Vss ever needs to be connected to chassis ground at a central point.

Resistors, R2, R3, and R4, are used to configure the primary coils of transformer (T1) for series or parallel connection. R2 and R3 provide parallel connection for a 120V AC input. Only R4 provides series connection for a 230V AC input.

**WARNING:**
Fuse, F1, protects the transformer primary and is necessary for UL544 approval. For 120V AC power, a 0.25A, UL198G, or a 0.2A, IEC127-3, time-lag fuse should be used. For 230V AC power, a 0.125A, UL198G, or a 0.1A, IEC127-3, time-lag fuse should be used. Check assembly drawing or schematic for proper Hill-Rom fuse.

The transformer full load output (as configured for this supply) is 9V rms at 2A rms.

PTCs, RT1 and RT2, protect the secondaries and the raw supply from overloads. They are also needed for IEC601-1 approval.

Resistor, R5, discharges capacitor, C3, when input power is removed.

Diode, D5, helps clamp line transients to 18V.

Connectors, P102 and P103, supply low voltage power and connect the LON net to external nodes.



## Air Control Board

### Echelon Node

The Echlelon node consists of an Echelon microprocessor (U1, MC143150FU, Neuron), 32Kbyte PROM (U2), power up reset circuit (U11), 10 MHz crystal, and an RS485 transceiver (U3). The nodes' I/O pins IO_0 thru IO_3 make up a 4 bit bi-directional data bus. IO_4 thru IO_6 are used as address lines for the HC138 decoder. The decoder outputs are chip select lines for the HC244A and HC240A buffers (inputs) and for the four HC175 flip-flops (outputs). IO_8 thru IO_10 make up the Neurowire bus. These three signals along with other chip select lines are used to transmit/receive data from the sensor/valve module in the mattress. Resistor, R111, is used as a termination load for the RS485 bus. If the air control board is not the last node on this bus, then this resistor should be removed.

### Latches and Buffers

Chip select (enable) lines of the HC244A and HC240A buffers allow their outputs, to access the data bus. The buffers are used to read the majority of this board's digital inputs. The chip select (clk) lines of the HC175 flip-flops are used to latch data already on the data bus into the flip-flops. Most of the outputs on this board are controlled from these flip-flops.

### Valve/Sensor Module Digital Control Lines

CONN_CHK is an input signal which determines if the user accessible connector (located under foot section) is connected or not. If the signal at P114-13 is LO then the cable is either disconnected or there is no logic power available on the sensor/valve board, in which case relay, K1, will be opened by the micro so that no significant power is available at the user accessible connector.

The output signals SEN_SEL_A, SEN_SEL_B, and SEN_SEL_C are used to select one of the six air pressure sensors for which data is to be received.

The EEPROM_CS output enables the EEPROM to access the Neurowire bus.

The A/D_D/A_CS output enables the A/D or the D/A converter to access the Neurowire bus.

The DATAOUT, DATAIN, and CLK signals make up the Neurowire bus. The CLK signal strobes data to the valve/sensor board on the DATAIN line and it strobes data from the valve/sensor board on the DATAOUT line.

Again the A/D_D/A_CS and EEPROM_CS chip select lines determine which IC on the valve/sensor board will access the Neurowire bus.

### Other Signals

The BDXT signal is not used on the ZoneAire Sleep Surface System.

SGMIF and SGMDF are signals from the patient pendant inflate and deflate switches. The pendant switches connect Vcc (via R83) from the air control board to connector P111 pins 3 and 4.

The CPR, and CPR RELEASE SW/ signals are not used on the ZoneAire Sleep Surface System.

LCD_IN is used to detect the presence of the patient pendant.

### External Watchdog

The circuitry surrounding U10 is an external watchdog timer circuit. In the event that the microprocessor locks up or gets lost, this circuit will clear all the flip-flop outputs and reset the Neuron. The Neuron’s software must pulse U10-6 at least once every 30 seconds to keep U10-8 from going LO. A falling edge of IO7 generates a 480us positive pulse at U10-6 due to C39 and R15. If IO7 is stuck HI or LO, the DC blocking capacitor, C39, allows R15 to pull the input

of the schmitt-trigger inverter LO which keeps U10-6 LO. U10 is a programmable timer with a 16 stage counter and internal oscillator. Upon power up the Q output goes HI. If MR, master reset, is constantly LO, the Q output will oscillate at 30 sec. HI then 30 sec. LO. A HI on MR resets the counter and keeps the Q output HI.

### 24V AC Solenoid Drivers

The circuitry surrounding U20 - U25 and Q3 - Q8 comprise the solenoid drivers used to open and close the air valves located in the mattress valve/sensor module.



Power for the solenoids comes from the off board 80VA, 24V AC secondary, transformer. Fuse, F2, provides primary coil protection and is sized to pass UL544 short and overload tests. Fuse, F1, provides secondary protection and is necessary for IEC601-1 short and overload tests. Zero ohm resistors, R80 - R82, are used to configure the transformer's primary coil for either 115V AC or 230V AC operation. Relay, K1, acts as a supervisory switch for solenoid power and logic power to the valve/sensor module. The relay is on continuously during normal operation. It is only turned off if the cable is disconnected, if a system failure is detected, or if the air system switch is turned off.

The 4 amp triacs, Q3 - Q8 are driven by the opto-triac drivers U20 - U25. Fuses, F3 - F8, provide overcurrent protection for the cable and valve/sensor module.

The circuitry surrounding U18 provides an O-Ring feedback function to the microprocessor. This circuit detects whether a triac is conducting. Resistors, R50 - R55 are sized so that only when a triac is conducting will the U18 opto's detector output switch. When a triac is conducting, the output of the opto is a 50 or 60 Hz square wave. This square wave keeps capacitor, C27, discharged so that the output of the Schmitt-trigger inverter is HI. When all triacs are in the blocking state, C27 charges up via R66 and R69 which allows the inverter output to go LO.

### Compressor and Crossover valve drivers

The circuitry surrounding Q9, Q10, U26, and U27 makes up the compressor and cross-over valve drivers. Q9 and Q10 are 800V, 8A, high noise immunity triacs. The circuitry around U19 is another O-Ring function similar to the one previously mentioned.

### ESD Protection

Some ICs have a 100 ohm resistor in series with its Vcc pin to limit Icc to 50 mA. This helps prevent latch-up. Switched inputs have RC protection for debounce and static. Digital outputs have a 5.0v TVS zener, 1K ohm resistor, and (Harris SP720) diode clamps.

### LON Connector (P112, P113)

Pins 2 and 7 provide unregulated logic power to the board from the central power supply.

Pins 3 and 8 are for unregulated logic power return.

Pins 4 and 5 are the Echelon net signal lines.

Pin 9 is the net shield connection.

### Regulator

RT1 provides overcurrent protection at currents over 0.5A. U15 regulates to + 5V DC $\pm$ 0.25V. Maximum output current for this application is approximately 385mA. U15 can maintain regulation with an input voltage down to 5.75V DC.

## Sensor Board Assembly

### General Description

The pressure sensing circuit provides the interface between the ZoneAire Sleep Surface System multiple air volume sleep surface and the ZoneAire Sleep Surface System control circuit.

The pressure sensing circuit consists of six air pressure transducers and a common mode reference voltage input which are multiplexed and amplified sequentially. The DC offsets are corrected for by a digital-to-analog (D/A) converter whose output negates the offsets of each transducer and reference amplified signal. An eight bit analog-to-digital (A/D) converter configured for nine bit accuracy converts the amplified signal to a digital form compatible with the serial interface requirements. Included in the circuit is a 64 word EEPROM which stores the required D/A DC offset compensation byte for the reference and each transducer, the A/D converter output corresponding to the reference input, the A/D converter output at zero psi for each transducer, and the A/D converter output at one psi for each transducer. This design allows all

circuit gain, offset, and calibration parameters to remain on board thereby allowing characteristic independence from the mating control processor circuit.

### Input Protection

Diodes D21-D26, D30 are transient voltage suppressors used to divert input electrostatic discharge (ESD) currents to ground. They have a breakdown voltage between 6.4 and 7 volts. The voltage at the input pins of the schmitt trigger U9 and NAND gate U7 cannot exceed the supply voltage by more than 1.5 volts nor can it drop below the ground potential by 1.5 volts. Therefore, any voltage build-up across the voltage suppressors is clamped by diodes D3-D14, D28, D29 through current limiting resistors R52, R54, R56, R58, R60, R62, R64. The inherent hysteresis of U9 provides clean logic levels and sharp transitions to the circuit's logic devices. U7 provides a clean logic level to the select line of multiplexers U1 and U10. Diode D27 is also a transient suppressor with a breakdown voltage between 20 and 24.4 volts.



### Output Protection

The output pin 6 of U7 cannot exceed the supply voltage by more than 0.5 volts nor can it drop below the ground potential by 0.5 volts. Therefore, any voltage build-up across voltage suppressor D15 must be clamped within 0.5 volts of the rails. To compensate for the approximately 0.7 volt turn-on voltage of D17, zener diode D16 and resistor R50 create a lower rail voltage of approximately 4.7 volts as a reference for clamping diode D17. Likewise, D19 and R49 create a (Vcc - 4.7) volt reference for clamping diode D18. R51 provides current limiting during transient events yet low line impedance during normal operation.

Capacitor C21 absorbs transient currents while R47 limits any current caused by an ESD event.

### EEPROM

Upon reset, the control processor reads the offset compensation constants from EEPROM. To do so, a logic level 0 (low) is applied to P131 pin 15 (EEPROM_CS). This results in a logic level 1 (high) at the chip select U3 pin 1 enabling the EEPROM. A 0 is then applied to P131 pin 4 (DATA_IN) as a start bit of 1 at U3 pin 3. A 0-1-0 clock pulse is then applied to P131 pin 14 (CLK). The low-to-high transition of the inverted pulse at U3 pin 2 causes the start bit to be clocked into the EEPROM as the first bit of the read instruction. The remainder of the read instruction is sent by clocking in seven more bits, 10XXX, where 10 is the opcode for "READ" and XXXXX is the complement of the address of the word being read. The next 16 clocks at P131 pin 14 clock the 16 bit word out U3 pin 4 on the U3 pin 2 rising edge. The most significant bit (MSB) is clocked out first, the least significant bit (LSB) last.

Resistor R24 acts as a current limiter which protects U3 should a latchup condition occur. C11 provides decoupling.

### Digital-to-Analog Converter

NAND gate U7 pin 1 acts as a D/A chip select pin. A logic level 0 at P131 pin 3 (A/D_D/A_CS) enables the CLK signal to the shift register U8. The complement of the MSB of the incoming byte is applied to P131 pin 4 (DATA_IN). A 1-0-1 clock pulse is then applied to P131 pin 14 (CLK). The low-to-high transition of the pulse at U2 pin 8 causes the MSB to be clocked into the shift register. The remainder of the byte is sent by clocking in the complement of the seven remaining bits. After the eight (8) clocks, the MSB is seen at U2 pin 13 and the LSB is seen at pin 3.



R63 is an R/2R resistor network whose output is 256 discrete voltage levels linearly spaced from Vss to approximately 2.90 volts. The voltage at R63 pin 16 is determined by the D/A byte shifted into U2. R46 scales the range of R63 pin 16 to the 2.90 volts described above.

Resistor R20 acts as a current limiter which protects U2 should a latchup condition occur. C12 provides decoupling.

### Analog Multiplexer

Analog multiplexer U1 routes the selected reference or pressure transducer output voltage to the amplifier. Resistor R19 acts as a current limiter which protects U1 should a latchup condition occur. C13 provides decoupling.

### Amplifier

The amplifier is a two stage differential amplifier circuit with a sum input at the first stage and a difference input at the second stage. U6 has low input offset voltage advantages while U5 has large output voltage swing advantages. R1 and R2 act as voltage dividers that apply approximately 1.93 volts at U6 pin 10. This voltage is passed through the unity gain amplifier to U6 pin 8. The differential voltages from the selected transducer are applied to U6 pin 3 and pin 5. The difference between these two voltages is amplified by a gain of approximately G = 256 and added to the 1.93 volts at U6 pin 8. This guarantees a voltage within the operating range of the amplifier including worst case component voltage tolerances and over the worst case pressure range. The voltage at U6 pin 7 is applied to a difference amplifier with gain of G = 2. The voltage at U5 pin 3 is the output of the D/A converter whose value is that needed to compensate for the DC offsets of the selected sensor and amplifier.

This voltage is subtracted from that at U6 pin 7 and the result is amplified by G = 2. The voltage at U5 pin 7 is then applied to the A/D converter U4 pin 3.

Resistor R3 acts as a current limiter which protects U6 should a latchup condition occur. C1 and C3 provide decoupling.

### Analog-to-Digital Converter

Analog-to-digital converter U4 can be addressed to operate in a differential mode. This allows it to be configured to operate with higher accuracy. Resistors R17 and R18 divide Vcc in half. This voltage is applied to the unity gain amplifier U6 whose output is applied to U4 pin 4 (CH 1). To select U4, a 1 is applied to P131 pin 3 (A/D_D/A_CS). This 1 is inverted by U9 and applied to U4 pin 2. A 0 is applied to P131 pin 4 (DATA_IN) as a start bit resulting in a 1 at U4 pin 13. A 0-1-0 clock pulse is then applied to P131 pin 14 (CLK). The low-to-high transition of the inverted pulse at U4 pin 12 causes the start bit to be clocked into the A/D as the first bit of the conversion instruction. The remainder of the conversion instruction is sent by clocking in three (3) more bits, 101, where 101 is the opcode for converting U4 CH 1 with respect to CH 0. The next eight clocks at P131 pin 14 clock the eight bit A/D byte out U4 pin 10 on the U4 pin 12 falling edge. The most significant bit (MSB) is clocked out first, the least significant bit (LSB) last. If the voltage at CH 0 is greater than Vcc/2 then a second conversion is required. After clocking in the start bit as described above, three more bits, 111, are clocked in where 111 is the opcode for converting U4 CH 0 with respect to CH 1. The next eight clocks at P131 pin 14 clock out the eight bit A/D byte as described above. C5 provides decoupling.

### Solenoid Drive

Connector P131 pins 7 - 12 routes the 24V, 50/60 Hz solenoid drive voltage directly to the solenoid valves through P132 pins 13, 11, 8, 6, 4, 2 respectively. P132 pins 1, 3, 5, 7, 10, 12 route the solenoid drive return to P131 pins 21 - 24 through zero ohm resistor R99.

### Grounds

Analog ground (Vss) and digital ground (GND) are tied together through zero (0) ohm resistor R29 to create a star ground configuration. This helps isolate noisy digital return currents from the analog returns.

Capacitor C22 provides a path to chassis ground for chassis referenced transients on the circuit grounds.

### Power Supply

Voltage regulator U8 maintains Vcc at 5 ± 0.25 volts. C6 and C7 maintain regulation stability. D2 provides a bleed off path for C6 during loss of power at P131 pin 1 (VBB2SW). P131 pin 13 (CONN_CHK) returns Vcc to the control processor board as an indication that the electrical connections between the two circuits are made.

Resistors R14, R16 voltage divides the unregulated supply VBB2SW by 0.263 to allow sampling by the A/D. Resistor R66 protects the A/D by current limiting any transients on VBB2SW.



## Caregiver Pendant

### Echelon Node

The Echelon node consists of an Echelon microprocessor (U6, MC143150FU, Neuron), 32Kbyte PROM (U1), power up reset circuit (U4), 5 MHz crystal, and an RS485 transceiver (U5). The nodes' I/O pins IO_5 thru IO_7 are used as inputs for the 3 x 3 switch matrix. IO_0 thru IO_2 are used as outputs to drive the 3 x 3 switch matrix. IO_8 thru IO_10 make up the Neurowire bus. IO_8 and IO_9 strobe LED data into the display driver (U3). Resistors, R1 - R3, are used as a termination load for the RS485 bus. Diode, D7, is the Neuron service LED.

### Switch Matrix

The nine switches are set up as three rows and three columns. A Schottky diode is in series with each switch. These diodes make it easier to identify which switch is pressed when several switches are closed.

The process of scanning the switches is as follows: Set outputs IO0 low, IO1 and IO2 high. If any switch in that column (S3, S2, S1) is closed, then the corresponding IO input lines (IO5, IO6, IO7) will detect a low (switch closed). Otherwise, a high indicates the switch is open. To scan the next column, set IO1 low, IO0 and IO2 high, then repeat the process.

### LEDs

The switch LEDs and the service required LED are strobed by the LED driver chip (U3). The neuron instructs the driver to turn the LEDs on or off via IO_8 and IO_9 (Neurowire). The mains power LED is on whenever DC power is available.

The multi-character display driver is a Motorola MC14489 used in the no decode mode. See Motorola data book “CMOS Application-Specific Standard ICs”, DL130 Rev 1 for more details. Three sets of data must be sent to the driver to control the LEDs. First 3 bits are sent to set up the test register. Secondly one byte is sent to set up the configuration register. For this application that data is 0b00111111. The third set of data is three bytes long with the first byte as setup data (0b0000000) and remaining bytes as LED state data.

### Connector P1

Pin 5 provides unregulated logic power to the board from the central power supply.

Pins 1 and 2 are for unregulated logic power return.

Pins 3 and 4 are the Echelon network signal lines (RS485 transceiver pair).

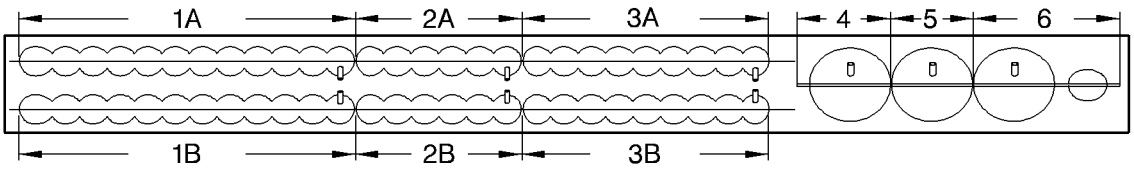
### Regulator

RT1 provides overcurrent protection at currents over 180mA. U2 regulates to + 5V DC $\pm$ 0.25V. Maximum output current for this application is approximately 110mA. U2 can maintain regulation with an input voltage down to 5.1V DC at these currents.

## Mattress Plumbing

The mattress contains three individual bladders segmented into nine separate sections. There is a port on the left side of each bladder that connects the bladders to their corresponding valve located in the footend of the mattress and possibly to another bladder. This port is only used for inflating and deflating the bladder (see figure 3-11 on page 3-37).

**Figure 3-9. Mattress Bladders**






There is also a port on the right side of each bladder that connects the bladders to their pressure sensor located at the footend of the mattress and possibly to another bladder. This port is only used to sense the air pressure in the bladder.

# Chapter 4
# Removal, Replacement, and Adjustment Procedures

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# 4.1 Mattress Replacement

Tools required: Wire tie cutter

## Removal

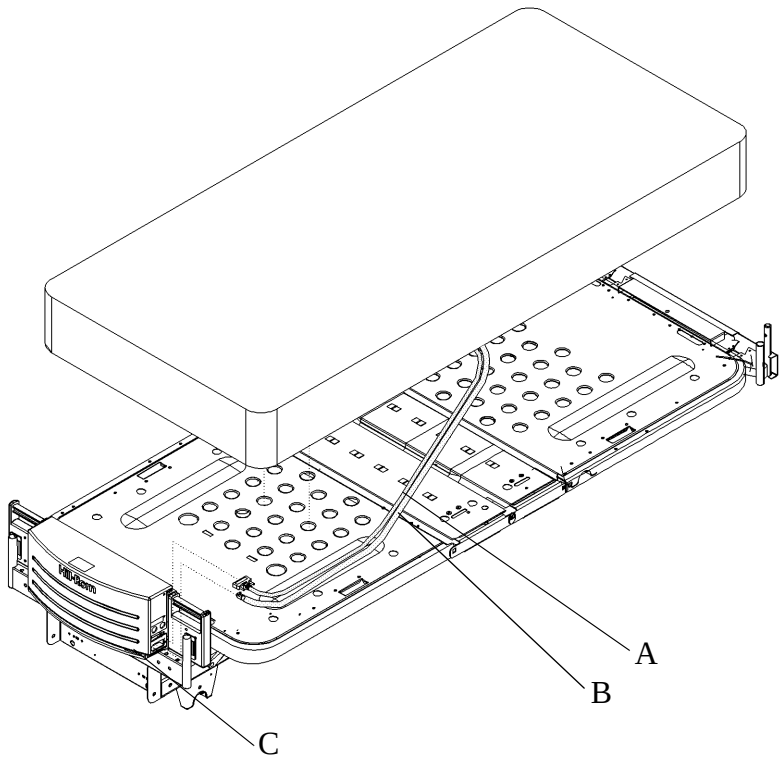
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Disconnect the mattress cable (A) from the power unit assembly (C) (see figure 4-1 on page 4-3).

**Figure 4-1. Sleep Surface Mattress Replacement**




3. Disconnect the air tube (B) from the power unit assembly (C).

4. Cut the red cable ties securing the power cable (A) and air tube (B) to the frame.

5. Disconnect the plastic buckle that secures the mattress to the bed frame.

6. Remove the mattress.

## Installation

7. Perform the removal procedure in reverse order. After the new mattress is installed, refer to the ZoneAire Sleep Surface System installation procedures for the proper cable and air hose routing.
    - For retractable beds: Advance series bed, 840 and 850 series bed, and Centra beds, refer to procedure 6.1.
    - For non-retractable beds: Century series and 425, 426, 715, 720, 723, 820, 822, 8200, 8350 beds, refer to procedure 6.2.
    - For Century CC bed: 892, 894, 895, 896 bed frames, refer to procedure 6.3.

## 4.2 Mattress Sensor Control Board Replacement

Tools required: 3/16" Nut driver
Standard head screwdriver

### Removal

1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

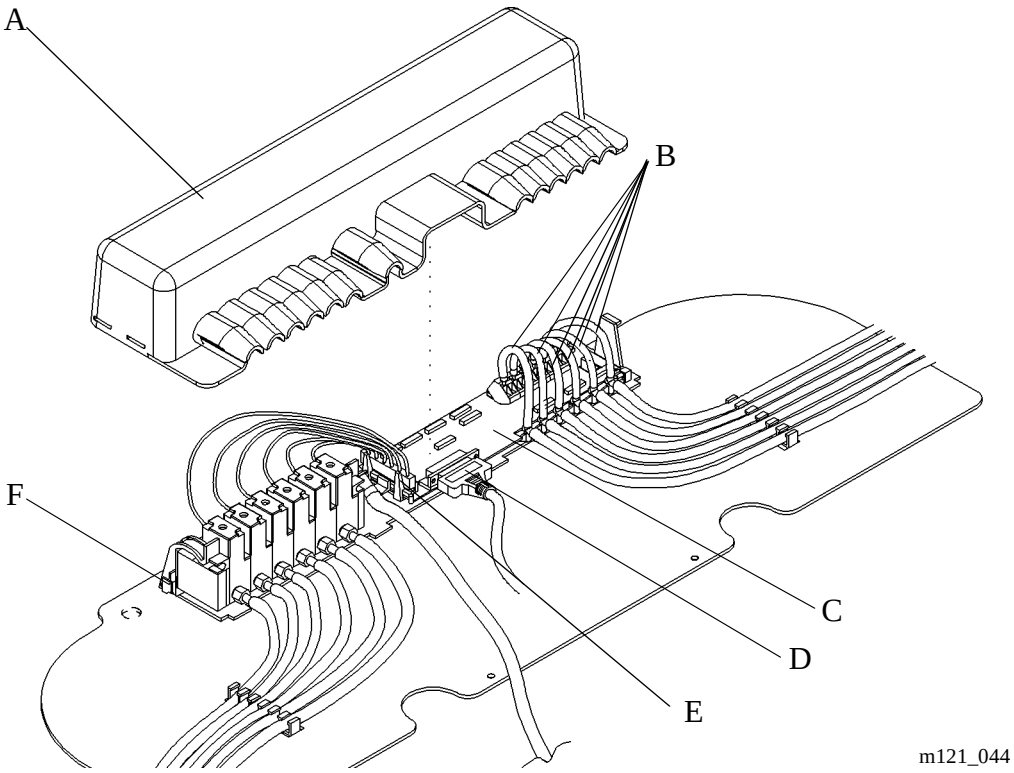
**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the foot panel from the bed.

3. Unzip the mattress to gain access to the components in the foot end of the mattress.

4. Remove the surface control cover (A) from the surface control frame (F) (see figure 4-2 on page 4-6).

**Figure 4-2. Mattress Sensor Control Board Replacement**






5. Using the standard head screwdriver, disconnect the mattress cable connector (D) from the sensor control board (C).

6. Disconnect the surface valves connector (E) from the sensor control board (C).

7. Remove the six tan colored hoses (B) from the sensor control board.

**NOTE:**
Note the orientation of the tan colored hoses before removing them from the sensor control board. You will need to know this for the installation procedure.

8. Using the 3/16" nut driver, remove the two screwlocks that secure the board to the frame.

9. Push the lever holding the sensor control board to the frame.

10. Remove the sensor control board (C).

## Installation

Perform the removal procedure in reverse order.

## 4.3 Sensor Control Valve Replacement

Tools required: Standard head screwdriver

### Removal

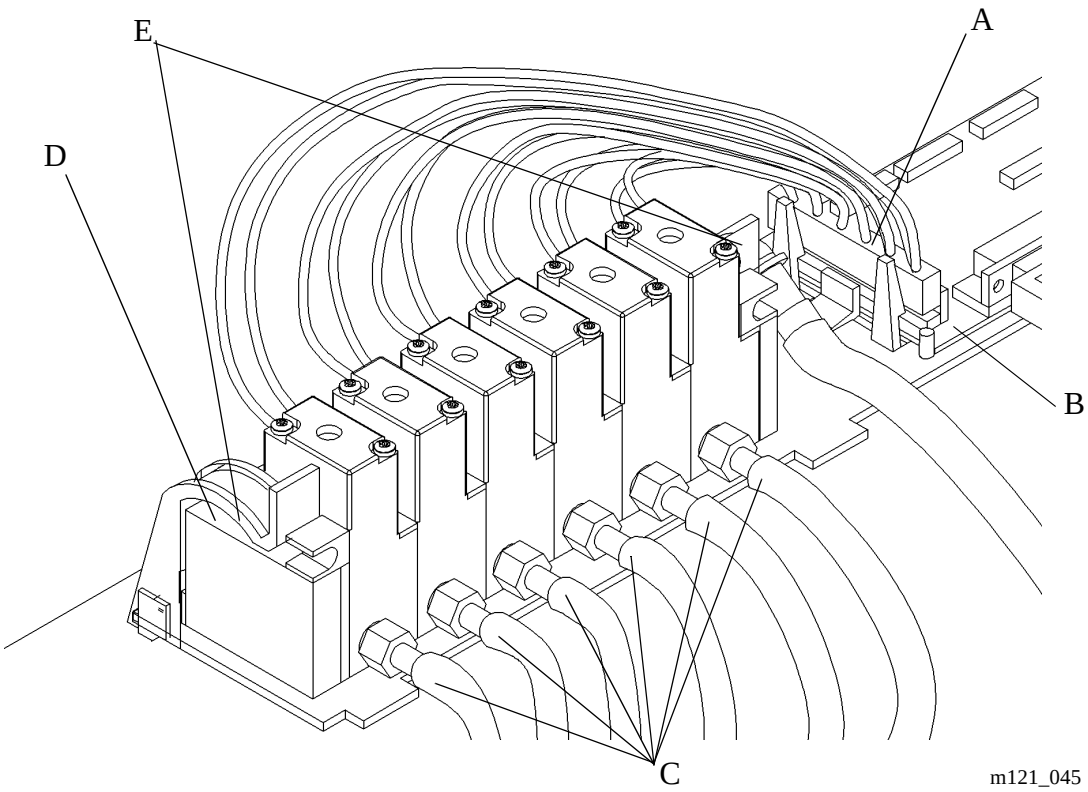
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the foot panel from the bed.
3. Unzip the mattress to gain access to the components in the foot end of the mattress.
4. Using the standard head screwdriver, remove the surface control cover (A) from the surface control frame (F) (see figure 4-2 on page 4-6).
5. Disconnect the surface valves connector (A) from the sensor control board (B) (see figure 4-3 on page 4-8).

**Figure 4-3. Sensor Control Valve Replacement**




6. Match mark each of the six air tubes (C) to the corresponding valve on the sensor control valve assembly (D).

7. Remove the six air tubes (C) from the sensor control valve assembly (D).

8. Push the valve release arms (E) on the surface control frame, and remove the sensor control valve (D).

## Installation

Perform the removal procedure in reverse order.

## 4.4 Mattress Cable Replacement

Tools required: Standard head screwdriver
Wire tie cutters

### Removal

1. Unplug the bed and the power unit from their power source.

2. Remove the foot panel from the bed.

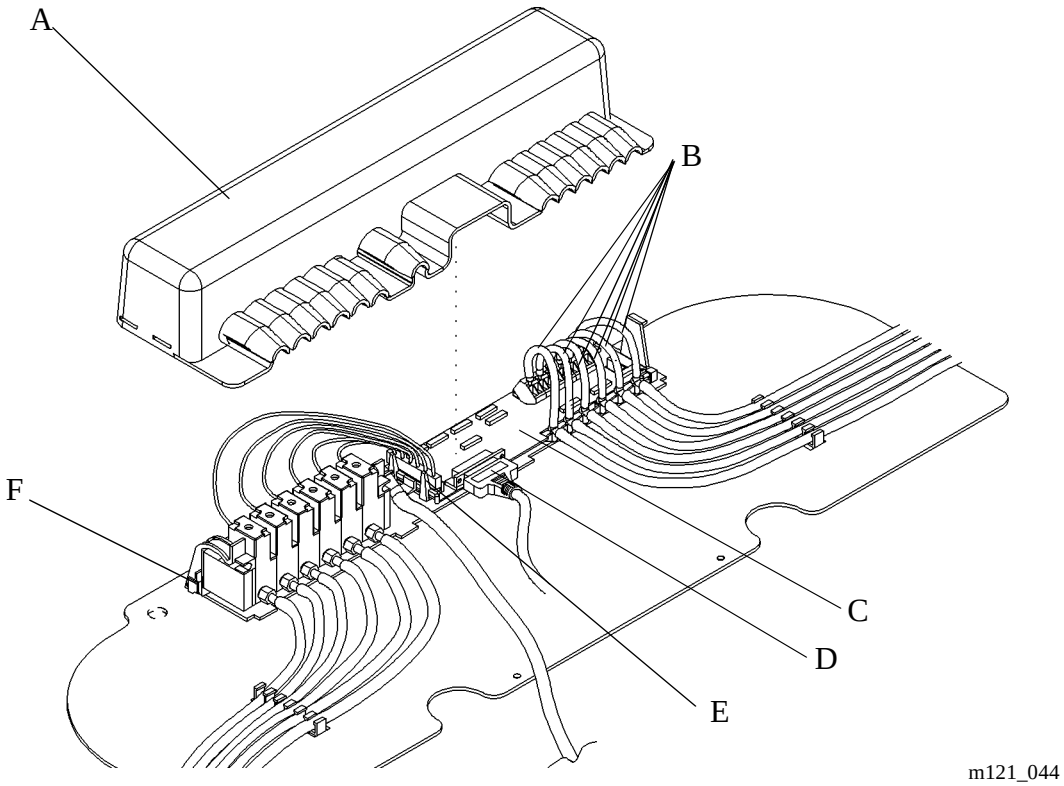
**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

3. Unzip the mattress to gain access to the components in the foot end of the mattress.

4. Using the standard head screwdriver, remove the surface control cover (A) from the surface control frame (F) (see figure 4-4 on page 4-10).

**Figure 4-4. Mattress Cable Replacement**






5. Using the standard head screwdriver, disconnect the mattress cable connector (D) from the sensor control board (C).

6. Cut all red wire ties that secure the mattress cable and mattress air hose to the frame.

7. Cut the wire tie on the sleeve and remove the mattress cable from the mattress.

## Installation

1. Route the new power cable along the patient right side and through the sleeve in the mattress.

2. Using the standard head screwdriver, connect the power cable connector (D) to the sensor control board (C).

3. **For retractable beds: Advance series bed, 840 and 850 series bed, and Centra beds**: Measure 57" along the mattress cable connector and air hose from the power unit. Mark this point on the cable and hose.
   **For non-retractable beds: Century series and 425, 426, 715, 720, 723, 820, 822, 8200, 8350 beds:** Measure 60" along the mattress cable connector and air hose from the power unit. Mark this point on the cable and hose.
   **For Century CC bed: 892, 894, 895, 896 bed frames:** Measure 70" along the mattress cable connector and air hose from the power unit. Mark this point on the cable and hose.

4. Using a wire tie, secure the cable and air hose marked point at the mattress sleeve.

5. After the new mattress cable is installed, refer to the ZoneAire Sleep Surface System installation procedures for the proper cable and air hose routing.
   - For retractable beds: Advance series bed, 840 and 850 series bed, and Centra beds, refer to procedure 6.1.
   - For non-retractable beds: Century series and 425, 426, 715, 720, 723, 820, 822, 8200, 8350 beds, refer to procedure 6.2,
   - For Century CC bed: 892, 894, 895, 896 bed frames, refer to procedure 6.3.

## 4.5 Mattress Air Tube Replacement

Tools required: Wire tie cutters
Standard head screwdriver

### Removal

1. Unplug the bed and the power unit from their power source.

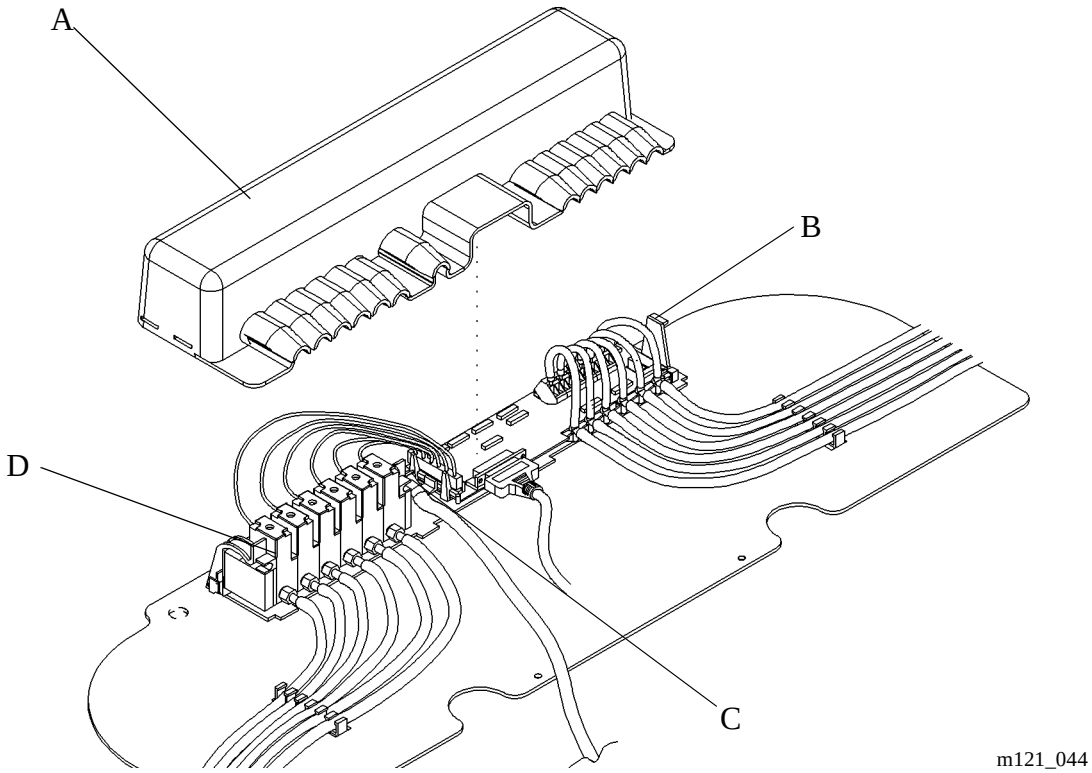
**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the foot panel from the bed.

3. Unzip the mattress to gain access to the components in the foot end of the mattress.

**Figure 4-5. Mattress Air Tube Replacement**




4. Using the standard head screwdriver, remove the surface control cover (A) from the surface control frame (B).

5. Disconnect the air tube (C) from the surface control valve (D).

6. Cut all red wire ties that secure the mattress air hose and mattress cable to the frame.

7. Cut the wire tie on the sleeve and remove the air tube from the mattress.

## Installation

1. Route the new air tube along the patient right side and through the sleeve in the mattress.

2. Connect the air tube (C) to the surface control valve (D)

3. **For retractable beds: Advance series bed, 840 and 850 series bed, and Centra beds**: Measure 57" along the power cable connector and air hose. Mark this point on the cable and hose.
   **For non-retractable beds: Century series and 425, 426, 715, 720, 723, 820, 822, 8200, 8350 beds:** Measure 60" along the power cable connector and air hose. Mark this point on the cable and hose.
   **For Century CC bed: 892, 894, 895, 896 bed frames:** Measure 70" along the power cable connector and air hose. Mark this point on the cable and hose.

4. Using a wire tie, secure the cable and air hose marked point at the mattress sleeve.

5. After the new air tube is installed, refer to the ZoneAire Sleep Surface System installation procedures for the proper cable and air hose routing.
   - For retractable beds: Advance series bed, 840 and 850 series bed, and Centra beds, refer to procedure 6.1.
   - For non-retractable beds: Century series and 425, 426, 715, 720, 723, 820, 822, 8200, 8350 beds, refer to procedure 6.2,
   - For Century CC bed: 892, 894, 895, 896 bed frames, refer to procedure 6.3.

## 4.6 Power Supply Board Replacement

Tools required: Phillips head screwdriver
Standard head screwdriver

### Removal

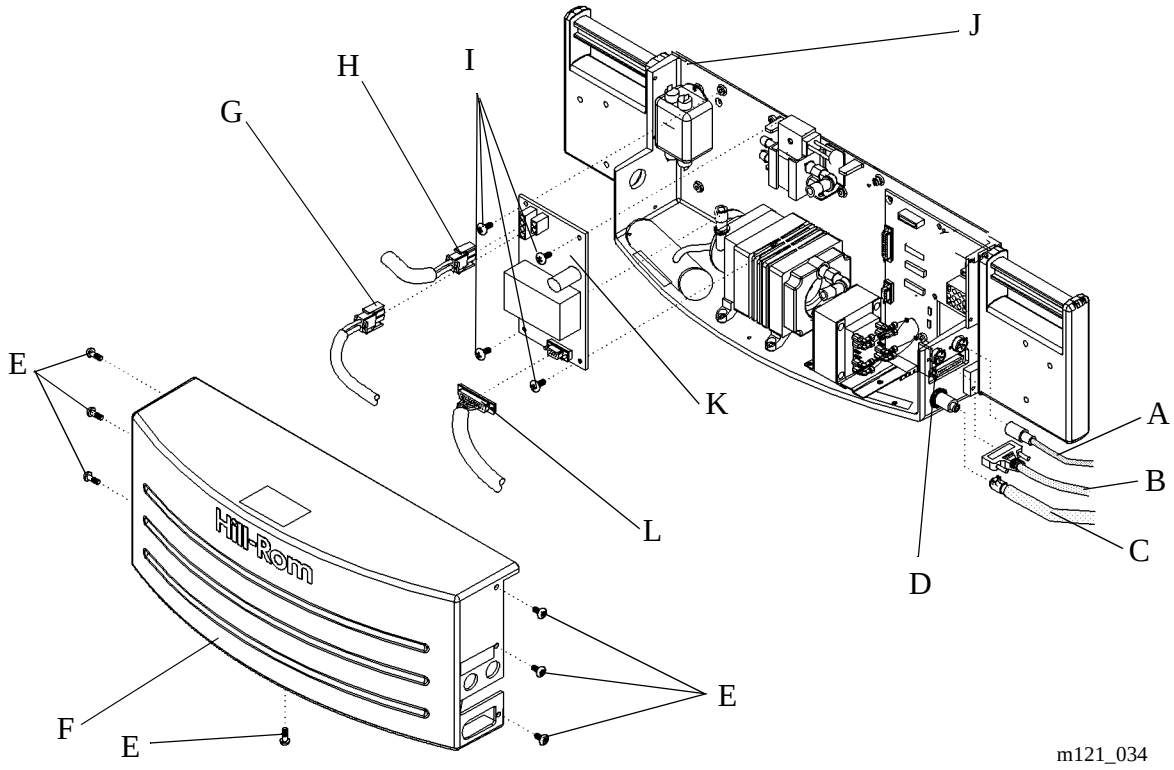
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 4-6 on page 4-16).

**Figure 4-6. Power Supply Board Replacement**






3. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power unit housing (J).

4. Remove the filter/power supply wiring assembly connector (H) from P28 on the power supply board (K).

5. Remove the air board/power supply wiring assembly connector (G) from P101 on the power supply board (K).

6. Using the standard head screwdriver, remove the caregiver pendant/power supply wiring assembly connector (L) from P103 on the power supply board (K).

7. Using the phillips head screwdriver, remove the four screws (I) that secure the power supply board (K) to the power unit housing (J).

8. Remove the power supply board (K) from the power unit housing (J).

## Installation

Perform the removal procedure in reverse order.

## 4.7 Air Control Board Replacement

Tools required: Phillips head screwdriver
Standard head screwdriver
Needle nose pliers

### Removal

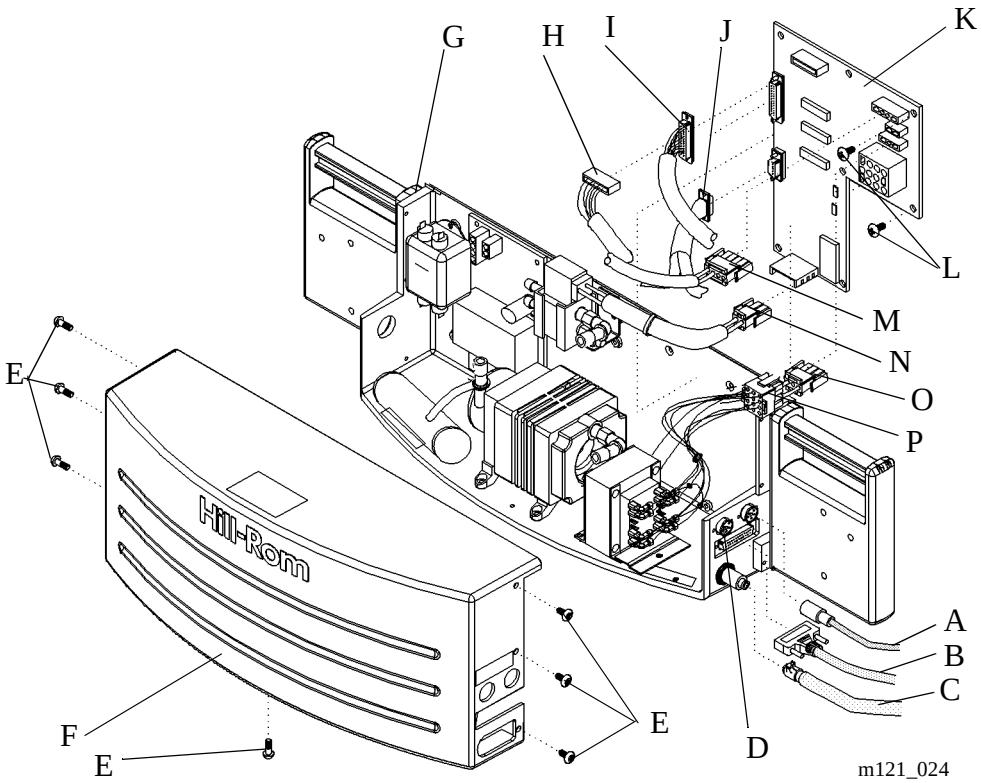
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 4-7 on page 4-18).

**Figure 4-7. Air Control Board Replacement**




3. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power unit housing (G).

4. Using the standard head screwdriver, remove the caregiver pendant wiring assembly connector (J) from P112 on the air control board (K).

5. Using the standard head screwdriver, remove the air board/sensor wiring assembly connector (I) from P114 on the air control board (K).

6. Remove the patient pendant wiring assembly connector (H) from P111 on the air control board (K).

7. Remove the power supply/air board connector (M) from P110 on the air control board (K).

8. Remove the switch valve wiring assembly connector (N) from P117 on the air control board (K).

9. Remove the air pump wiring assembly connector (O) from P116 on the air control board (K).

10. Remove the transformer wiring assembly connector (P) from P118 on the air control board (K).

11. Using the phillips head screwdriver, remove the two phillips head screws (L) that secure the air control board (K) to the power unit assembly.

12. Compress the three standoffs located on the air control board and remove the air control board (K).

## Installation

Perform the removal procedure in reverse order.

## 4.8 Switching Valve Assembly Replacement

Tools required: Phillips head screwdriver
Standard head screwdriver

### Removal

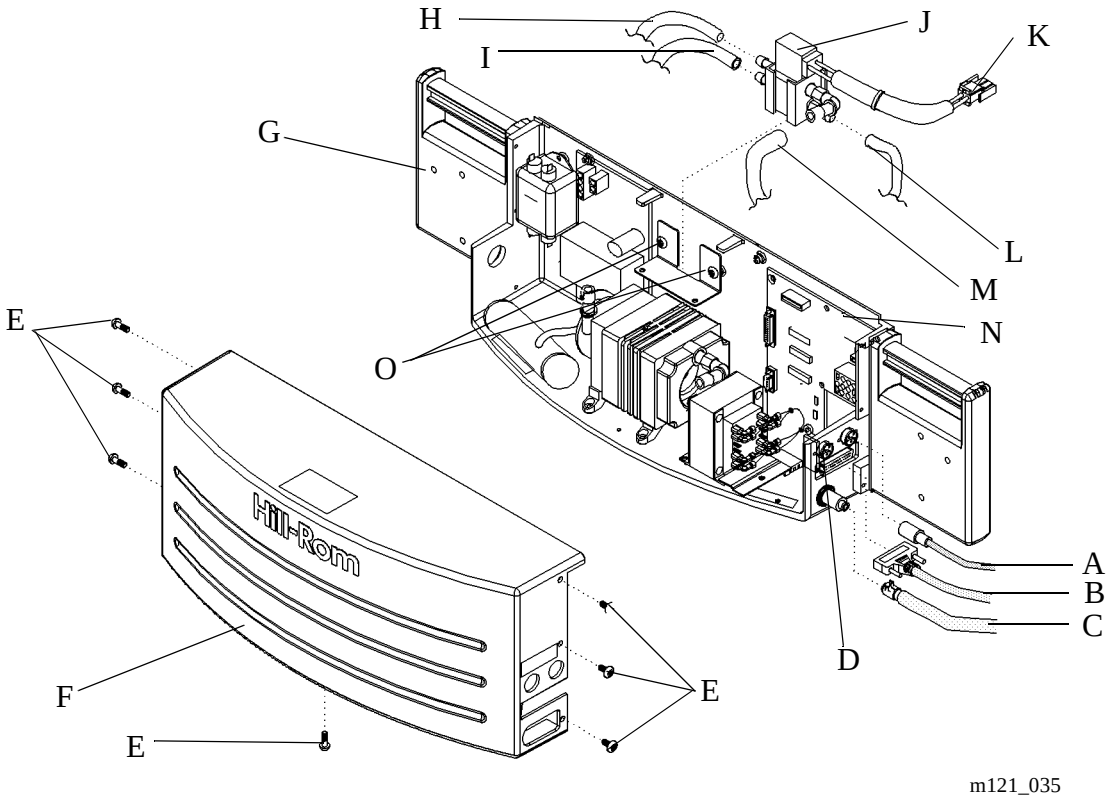
1. Unplug the bed and the power unit from their power sources.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. *Remove the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 4-8 on page 4-20).

**Figure 4-8. Switching Valve Assembly Replacement**



3. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power unit housing (G).

4. Remove the quick coupling hose (H), the muffler hose (I), the air pump input hose (L), and the air pump output hose (M) connected to the switching valve assembly (J).

5. Disconnect the switching valve wiring assembly connector (K) from P117 on the air control board (N).

6. Using the phillips head screwdriver, remove the two screws (O) that secure the switching valve bracket to the power unit housing (G).

7. Using the standard head screwdriver, pry and lift the switching valve assembly (J) out of the switching valve bracket.

## Installation

Perform the removal procedure in reverse order.

## 4.9 Transformer Replacement

Tools required: Phillips head screwdriver
Needle nose pliers

### Removal

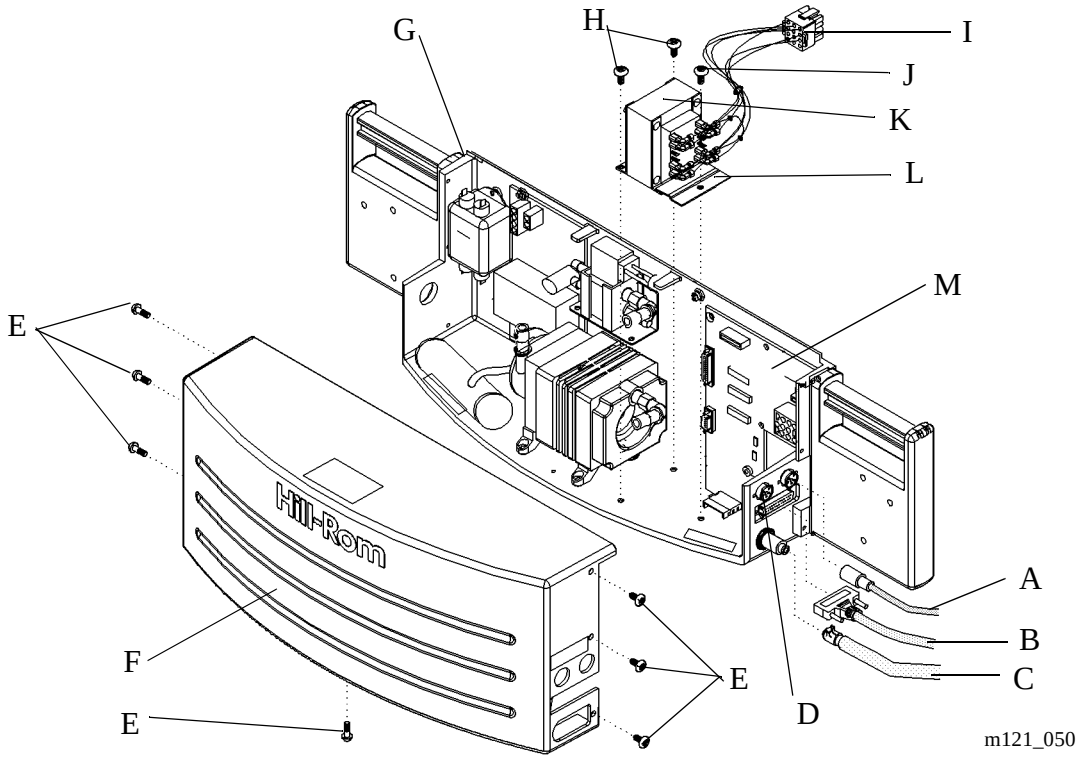
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional), from the power unit assembly (see figure 4-9 on page 4-22).

**Figure 4-9. Transformer Replacement**



3. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power supply housing (G).

4. Disconnect the transformer wiring assembly connector (I) from the air control board (M) P118.

5. Using the phillips head screwdriver, remove the screw (J) that secures the transformer bracket (L) to the power unit housing (G).

6. Using the phillips head screwdriver, remove the two screws (H) that secure the transformer (K) to the power unit housing (G).

7. Remove the transformer (K).

8. Using the needle nose pliers, remove the wires from the transformer terminals.

## Installation

Perform the removal procedure in reverse order. Connect the transformer wires as follows:

- Orange wire to terminal 6
- Violet wire to terminal 12
- Red wire to terminal 5
- Brown wire to terminal 2
- Black wire to terminal 1
- Yellow wire to terminal 7
- Blue wire to terminals 8 and 11

## 4.10 Compressor Replacement

Tools required: Phillips head screwdriver
Wire tie cutters

### Removal

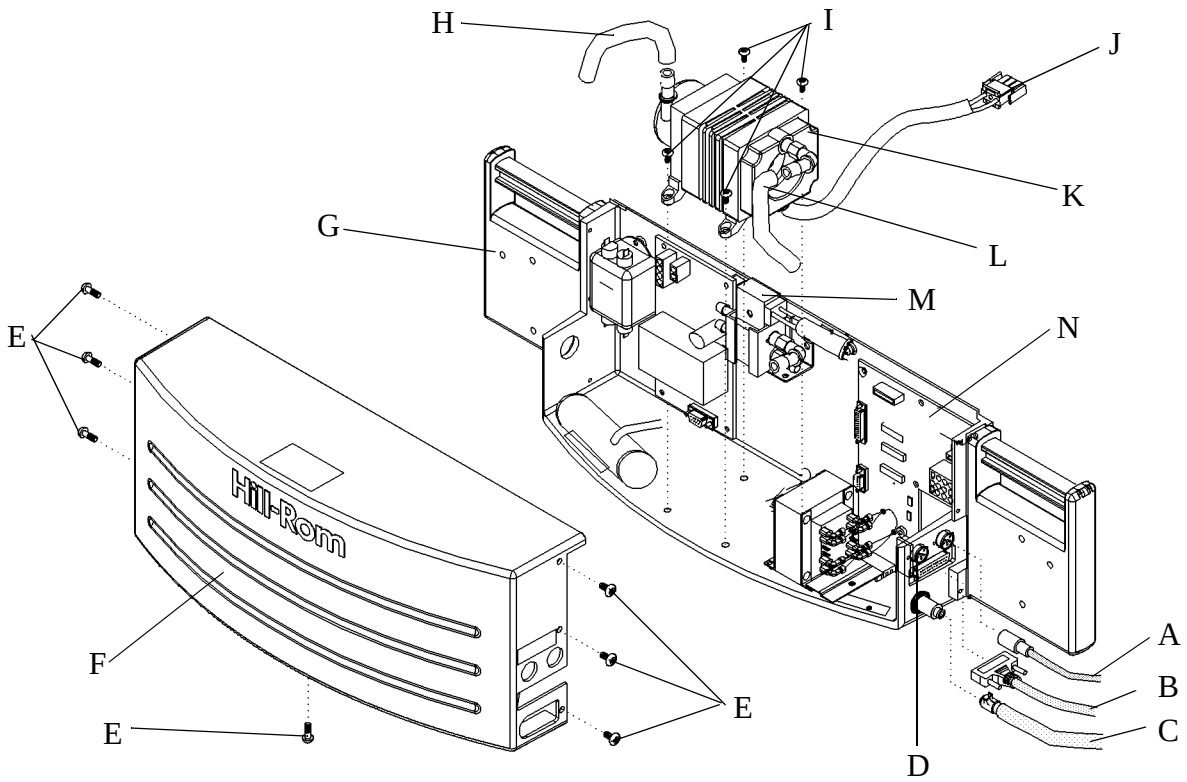
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 4-10 on page 4-24)

**Figure 4-10. Compressor Replacement**



3. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power supply housing (G).

4. Remove the connector (J) from P116 on the air control board (N).

5. Using the wire tie cutters, cut the wire tie that secures air hose (H) to the compressor.

6. Remove the air hose (H) that goes from the compressor (K) to the switching valve assembly (M).

7. Remove the air hose (L) that goes from the compressor (K) to the switching valve assembly (M).

8. Using the phillips head screwdriver, remove the four screws (I) that secure the compressor (K) to the power unit housing (G).

9. Remove the compressor (K).

## Installation

Perform the removal procedure in reverse order. Replace the wire tie that was removed in step 5.

## 4.11 Line Filter Replacement

Tools required: Phillips head screwdriver
Needle nose pliers

### Removal

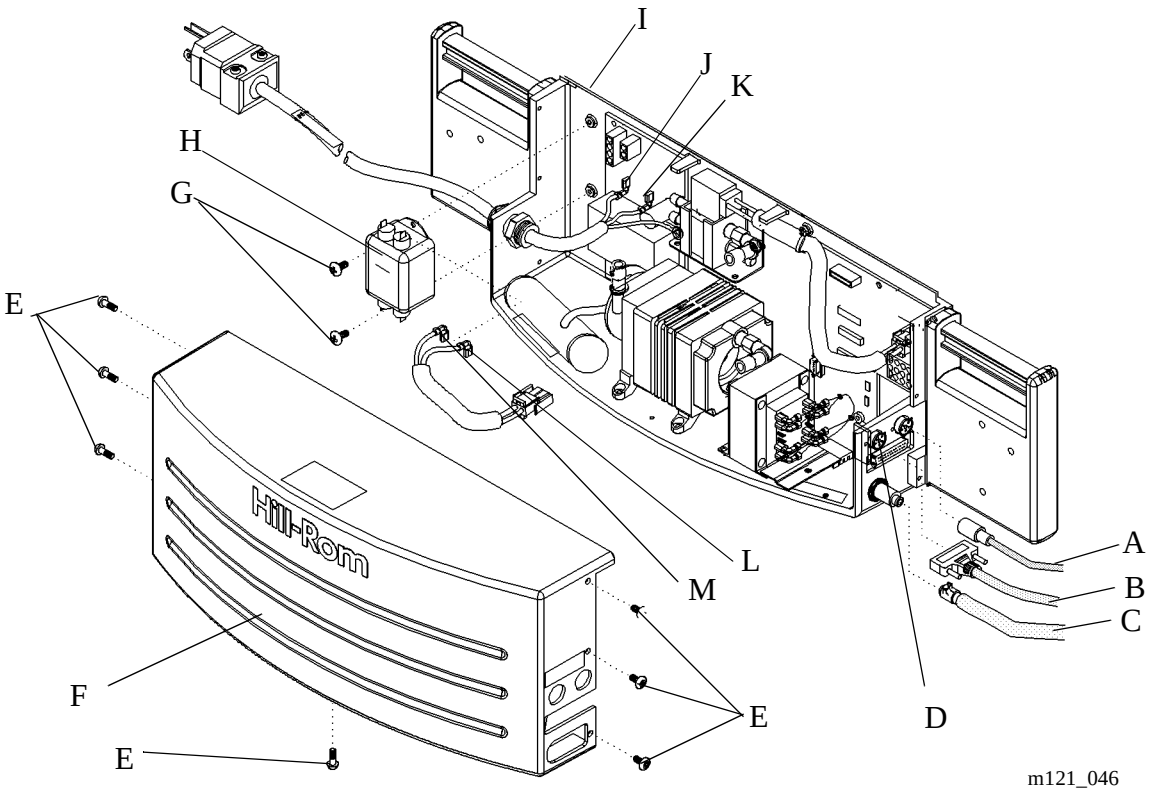
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 4-11 on page 4-26).

**Figure 4-11. Line Filter Replacement**



3. Using the phillips head screwdriver, remove the seven screws (E) that secure the power unit cover (F) to the power supply housing (I).

4. Using the needle nose pliers, remove the filter/power supply wiring assembly white wire (M) from the noise filter stud number 3.

5. Using the needle nose pliers, remove the filter/power supply wiring assembly black wire (L) from the noise filter stud number 4.

6. Using the needle nose pliers, remove the power cord white wire (J) from the noise filter stud number 1.

7. Using the needle nose pliers, remove the power cord black wire (K) from the noise filter stud number 2.

8. Using the phillips head screwdriver, remove the two phillips head screws (G) that secure the line filter (H) to the power unit housing (I), and remove the filter.

## Installation

Perform the removal procedure reverse order.

**NOTE:**
Make sure terminals 1 and 2 are oriented toward the bottom of the power unit assembly.

## 4.12 Power Unit Power Cord Replacement

Tools required: Phillips head screwdriver
Needle nose pliers
1 1/4" open end wrench

### Removal

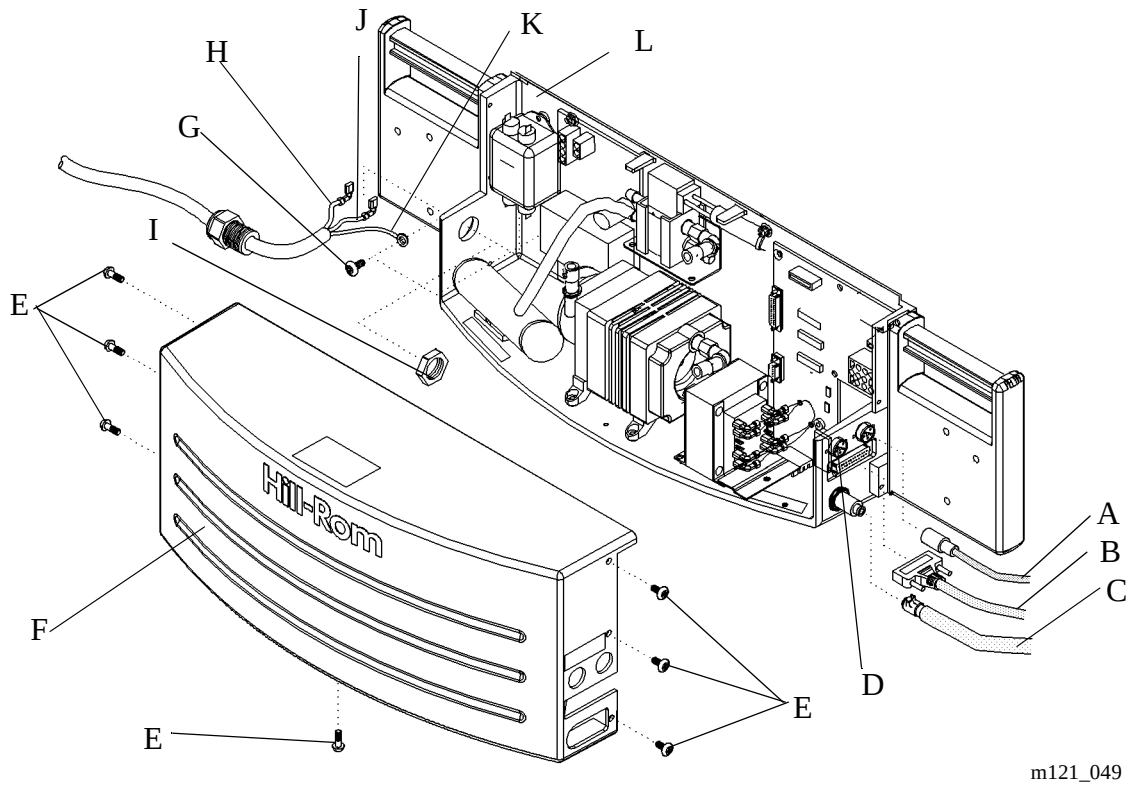
1. Unplug the bed and the power unit from their power source.

**SHOCK HAZARD:**
An electrical shock hazard exists if you do not unplug the ZoneAire Sleep Surface System from its power source.

**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Remove the caregiver pendant connector (A), the mattress cable (B), the mattress air hose (C), and the patient pendant connector (D) (optional) from the power unit assembly (see figure 4-12 on page 4-29).

**Figure 4-12. Power Plug Replacement**




3. Using the phillips head screwdriver, remove the seven phillips head screws (E) that secure the power unit cover (F) to the power supply housing (L).

4. Using the needle nose pliers, remove the power cord white wire (H) from the noise filter stud number 1.

5. Using the needle nose pliers, remove the power cord black wire (J) from the noise filter stud number 2.

6. Remove the phillips head screw (G) that secures the power cord green ground wire (K) to the power unit housing (L).

7. Using the 1 1/4" wrench, remove the locking nut (I) that secures the power cord to the housing (L).

8. Remove the power cord.

## Installation

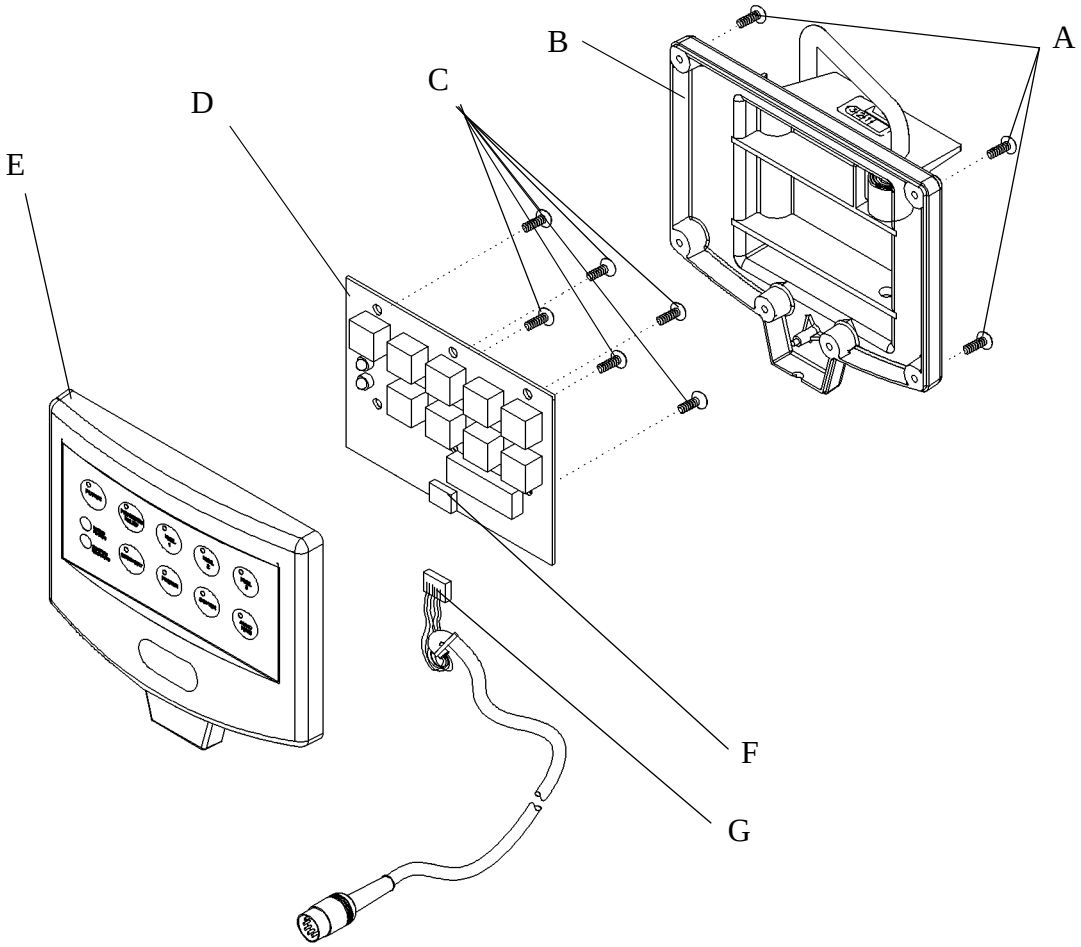
Perform the removal procedure in reverse order.

## 4.13 Caregiver Pendant PC Board And Cable

Tools required: Phillips head screwdriver

1. Using the phillips head screwdriver, remove the six phillips head screws (A) that secure the back cover (B) to the front cover (E).

**Figure 4-13. Caregiver Pendant**




**CAUTION:**
Wear an appropriate static strap when working with electronics to prevent component damage.

2. Using the phillips head screwdriver, remove the six phillips head screws that secure the board (D) to the front cover (E). Remove the board.

3. Disconnect the caregiver pendant cable connector (G) from P1(F) located on the board (D).

## Installation

Perform the removal procedure in reverse order.

**NOTES:**

# Chapter 5
# Parts List

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**NOTES:**

## Warranty

# Hill-Rom®

### A Hillenbrand Industry

# LIMITED WARRANTY

Hill-Rom has a long tradition of providing superior quality products and service to our customer. Our goal is "Total Customer Satisfaction." In that spirit, Hill-Rom is proud to offer the following warranty.

## GENERAL WARRANTY:

Hill-Rom warrants to the original purchaser that its products shall be free from defects in material and workmanship for a period of one (1) year after date of delivery. Hill-Rom's obligation under this warranty is expressly limited to supplying replacement parts and/or service for, or replacing, at its option, any product which is, in the sole discretion of Hill-Rom, found to be defective. In addition to the foregoing one year warranty, Hill-Rom warrants to the original purchaser that the frame and welds on its beds will be free from structural defects for the life of the bed. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OF PURPOSE. HILL-ROM'S OBLIGATION UNDER THESE WARRANTIES SHALL NOT INCLUDE ANY LIABILITY FOR LOSS OF PROFITS, DIRECT, INDIRECT OR CONSEQUENTIAL DAMAGES OR DELAYS. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply. If requested by Hill-Rom, products or parts for which a warranty claim is made shall be returned prepaid to Hill-Rom's factory. Any improper or negligent use, any alterations or repairs not in accordance with Hill-Rom's manuals or performed by others in such manner as in Hill-Rom's judgement affects the product materially and adversely, shall void these warranties. No employee or representative of Hill-Rom is authorized to change these warranties in any way or grant any other warranty. These warranties shall not apply outside the United States. These warranties provide specific legal rights; however, there may be other available rights, which vary from state to state.

**PART AVAILABILITY POLICY:** Hill-Rom will supply parts for new products for fifteen (15) years from date of last manufacture, and on remanufactured products for ten (10) years from date of sale.

**OUT OF WARRANTY EXCHANGE POLICY:** After the expiration of the original warranty, upon request, Hill-Rom will ship as a replacement, rebuilt electric motors, control boards, and air compressors for like units returned to Hill-Rom by the original purchaser for forty percent (40%) of the then-current new price. The exchange price is a substantial savings to the hospital as compared to the price of a new motor, control boards, and air compressors. The replacement motors, control boards and air compressors will carry a new one (1) year parts warranty.

## SPECIFIC WARRANTIES:

**MATTRESS WARRANTIES:**

**DYNAMICAIRE™ SLEEP SURFACE:** Hill-Rom warrants to the original purchaser that its product shall be free from defects in material and workmanship for a period of two (2) years from date of delivery. After the expiration of this warranty, the surface components may be purchased at 50% of the then-current price during the third, fourth and fifth years after date of delivery.

(Continued)

**COMFORTLINE® MATTRESS:** Hill-Rom warrants to the original purchaser that its product shall be free from defects in material and workmanship for a period of two (2) years from date of delivery. After the expiration of this warranty, the mattress components may be purchased at 50% of the then-current price during the third, fourth and fifth years after date of delivery.

**ZONEAIRE™ SLEEP SURFACE:** Hill-Rom warrants to the original purchaser that its product shall be free from defects in material and workmanship for a period of two (2) years from date of delivery. After the expiration of this warranty, the surface components may be purchased at 50% of the then-current price during the third, fourth and fifth years after date of delivery. Electro mechanical components (compressor, valves, printed circuit boards, hoses and couplers) are warranted to be free from defects in material and workmanship for a period of one (1) year from date of delivery.

**INNERSPRING MATTRESS:** Hill-Rom warrants to the original purchaser that its product shall be free from defects in material and workmanship for the following specified periods from date of delivery. SureRest® III: Twelve (12) year prorated warranty; SureRest II: Ten (10) year prorated warranty; SureRest I: Five (5) year prorated warranty.

**PERINATAL MATTRESS:** Hill-Rom warrants to the original purchaser that its product shall be free from defects in material and workmanship for a period of one (1) year, when used with proper draping practices, from date of delivery.

**FOAM MATTRESS:** Hill-Rom warrants to the original purchaser that its product shall be free from defects in material and workmanship for a period of two (2) years from date of delivery.

**COMPOSER™ COMMUNICATION SYSTEM WARRANTIES:**

**COMPOSER HARDWARE WARRANTIES:** Hill-Rom warrants to the original purchaser that the hardware components of the COMposer shall be free from defects in material and workmanship for a period of one (1) year after the date of system certification. Hill-Rom's obligation under this warranty is expressly limited to supplying replacement parts and/or service for, or replacing, at its option, any product which is, in the sole discretion of Hill-Rom, found to be inoperable.

**COMPOSER SOFTWARE WARRANTIES:** Hill-Rom warrants to the original purchaser that the physical diskettes on which COMposer system software is distributed shall be free from defects in material and workmanship for a period of sixty (60) days from the date of delivery. The entire and exclusive remedy available to the purchaser under this warranty is limited to replacement of inoperable diskettes and shall not extend to any claim for or right to recover any damages, including but not limited to, loss of profit, data or use of the software, or special, incidental or consequential damages, or other similar claims.

**COMPOSER EXPENDABLES WARRANTIES:** Hill-Rom warrants for sixty (60) days the expendable parts such as locator badge batteries and dome light incandescent bulbs.

## OTHER WARRANTIES:

**EXPENDABLES WARRANTIES:** A sixty (60) day limited warranty applies to expendable parts such as overhead fluorescent tubes, heating elements and temperature probes.

**UPGRADE KIT WARRANTIES:** Hill-Rom warrants to the original purchaser that its product shall be free from defects in material and workmanship for a period of one (1) year from date of delivery. The warranty on existing product is not affected. A Product Assurance and/or Preventive Maintenance contract will be offered at the time of installation for a pre-determined fee. This will act to advise the customer of the condition of Hill-Rom products being upgraded along with specific parts and PM recommendations.

**FOR PARTS AND SERVICE UNDER THESE WARRANTIES:** Call Hill-Rom Technical Support Department at (800) 445-3720, Monday through Friday. In order to expedite service, we request you furnish the following information: customer identification number, product model number, serial number, and description of problem. A qualified Specialist will provide, via telephone, troubleshooting assistance for hospital personnel and provide necessary parts to make repairs. If telephone troubleshooting determines the need for on-site technical service, a qualified Territory Service Representative will be dispatched. Replacement of non-technical items will be the responsibility of the customer. These warranties do not cover failures due to misuse, abuse, neglect or lack of routine maintenance, which are the responsibility of the owner.

Revised November 1, 1995

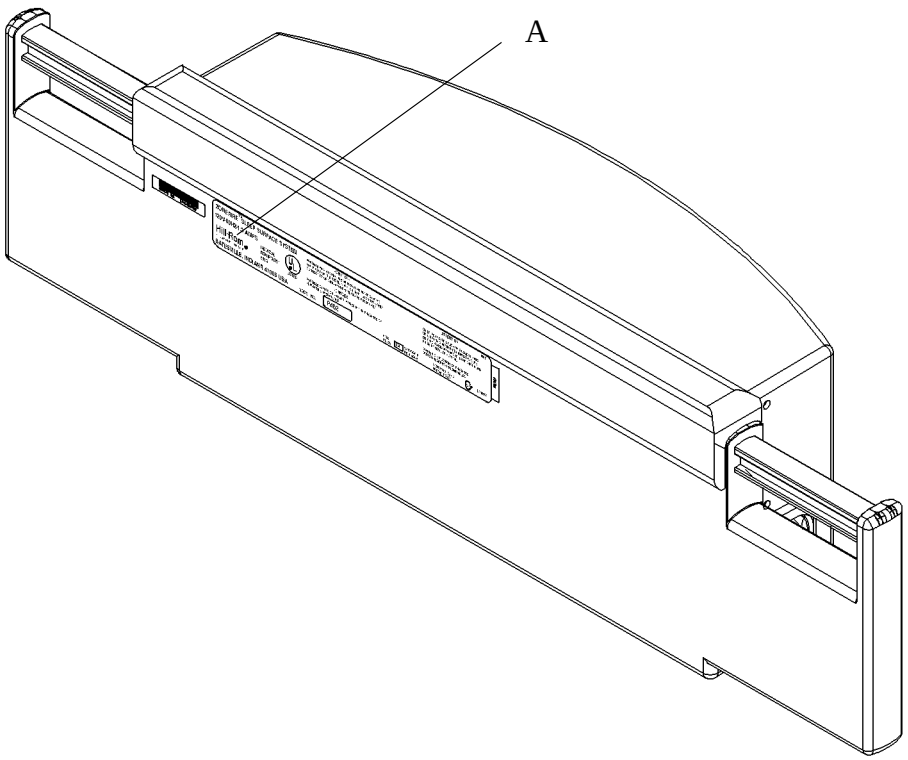
## Ordering Service Parts

Use the parts lists in this service manual to identify the part numbers you require.

Call your Technical Customer Support Specialist at the Hill-Rom Technical Support Department—phone (800) 445-3720. To help expedite the processing of your parts order, please have your six-digit customer account number, purchase order number, product number, and serial number available for the Technical Customer Support Specialist when you call.

**NOTE:**
You will find the product number and serial number on the product identification label (A) (see figure 5-1 on page 5-5).

**Figure 5-1. Location of Identification Label**

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For your convenience, Hill-Rom provides a telefax number to promptly order parts, request part prices and availability, or to follow up on a service order. The telefax number is (812) 934-8472.

We suggest a minimum of $40.00 when placing orders for service parts. This will help prevent an increase in the cost of processing your service order.

Terms:

- Net 30 days.
- F.O.B. Batesville, Indiana.
- Shipping charges are prepaid and added to the invoice.
- All service orders are shipped UPS ground, unless you specifically request an alternative method.

Address all inquiries to:

Hill-Rom Company
1069 State Route 46 E
Batesville, Indiana 47006-9167
Attention: Technical Support—Parts

Address all return goods to:

Hill-Rom Company
Distribution Center Door D23
County Road 300E
Batesville, Indiana 47006-9167
Attention: Service Stores



**NOTE:**
To eliminate possible delays or incorrect billings, **do not** return any items without a Return Material Authorization (RMA) number. A Return Material Authorization packet is included with each order when a return is requested. This packet includes an RMA number, instructions, and a shipping label. If misplaced, obtain an RMA number by phoning the Hill-Rom Technical Support Department at (800) 445-3720.

# Exchange Policy

The following are Hill-Rom's policies for in-warranty and out-of-warranty exchanges.

## In-Warranty Exchanges

Hill-Rom will request that parts/products be returned for inspection in some cases. When this occurs, you are expected to return parts/products within 30 days. If you fail to return the inoperative parts/products within the 30 day period, Hill-Rom will invoice your facility for the full selling price of the parts/products.

**NOTE:**
The preceding billing procedure **only** pertains to parts/products that Hill-Rom requests to be returned.

In some cases, the invoice sent with the parts will show the full selling price of the parts. This is for Hill-Rom's internal use only and should not be confused with the price you will actually pay.

Please do not return any parts without an RMA number. Hill-Rom will include a Return Material Authorization packet with the parts/products shipment when parts/products have been requested to be returned. If misplaced, obtain an RMA number by phoning the Hill-Rom Technical Support Department at (800) 445-3720.

## Out-of-Warranty Exchanges

You are expected to return the inoperative parts/product to Hill-Rom within 30 days. Hill-Rom will include a Return Material Authorization packet with the parts/products shipment. If misplaced, obtain an RMA number by phoning the Hill-Rom Technical Support Department at (800) 445-3720. If you fail to return the equipment within 30 days, Hill-Rom will invoice your facility for **the difference between the exchange price and the new price of the part**.



# Recommended Spare Parts

There are no recommended spare parts for the ZoneAire Sleep Surface System.

# Power Unit Assembly

**Figure 5-2. Power Unit Assembly**

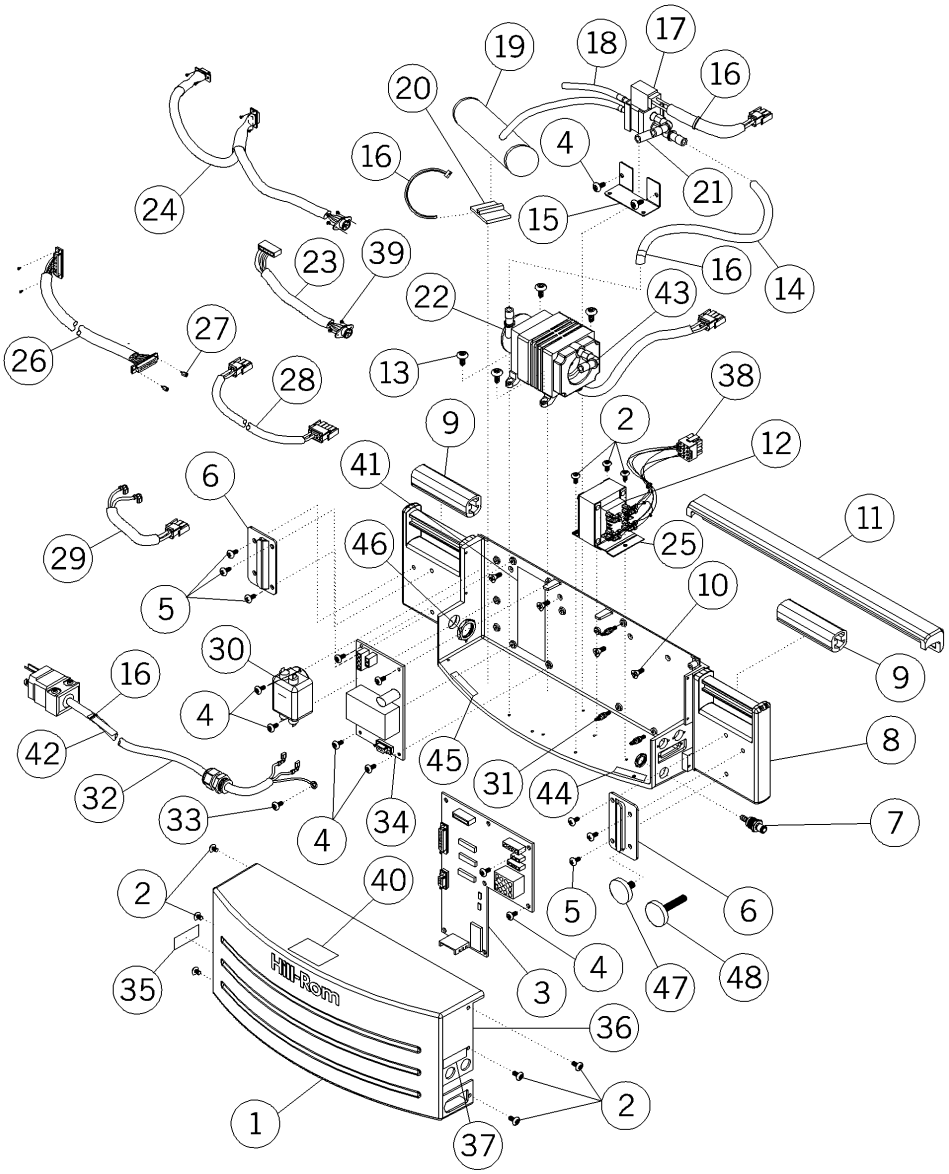


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**Table 5-1. Power Unit Assembly**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | 46922 (462) | 1 | Power unit cover |
| 2 | 9002712 (462) | 10 | Screw |
| 3 | 4476004 (462) | 1 | Air control board assembly |
| 4 | 9002506 (462) | 10 | Screw |
| 5 | 4921 (462) | 6 | Screw |
| 6 | 4692448 (462) | 2 | Mounting bracket |
| 7 | 48691 (462) | 1 | Quick coupling |
| 8 | 46921 (462) | 1 | Power unit housing |
| 9 | 46923 (462) | 2 | Handle cover |
| 10 | 9003108 (462) | 4 | Screw |
| 11 | 46925 (462) | 1 | Bumper strip |
| 12 | 45575 (462) | 1 | Transformer |
| 13 | 9002708 (462) | 4 | Machine screw |
| 14 | 46931 (462) | 1 | PVC tube |
| 15 | 47023-pl (462) | 1 | Switching valve bracket |
| 16 | 19124 (462) | 4 | Large cable tie |
| 17 | 47083 (462) | 1 | Switching valve assembly |
| 18 | 4875602 (462) | 1 | PVC tube |
| 19 | 47103 (462) | 1 | Muffler assembly |
| 20 | 48694 (462) | 1 | Tie holder |
| 21 | 4875603 (462) | 1 | PVC tube |
| 22 | 46918 (462) | 1 | Air pump assembly |
| 23 | 46939 (462) | 1 | Patient pendant wiring assembly |
| 24 | 46936 (462) | 1 | Caregiver pendant wiring assembly |
| 25 | 45684 (462) | 1 | Transformer bracket |
| 26 | 46938 (462) | 1 | Air board/sensor wiring assembly |
| 27 | 28968 (462) | 2 | Screw lock |
| 28 | 46935 (462) | 1 | Power supply/air board wiring assembly |
| 29 | 46934 (462) | 1 | Filter/power supply wiring assembly |
| 30 | 41439-10 (462) | 1 | Noise filter |
| 31 | 46928 (462) | 3 | Standoff |

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 32 | 46927 (462) | 1 | AC power cord assembly |
| 33 | 90058-04 (462) | 1 | Screw |
| 34 | 4471904 (462) | 1 | Power supply board assembly |
| 35 | 22247 (462) | 1 | Caution label |
| 36 | 48775 (462) | 1 | Sound insulation |
| 37 | 46933 (462) | 1 | Pendant position label |
| 38 | 46940 (462) | 1 | Transformer cable assembly |
| 39 | 90073-04 (462) | 4 | Screw |
| 40 | 46932 (462) | 1 | Oxygen tent label |
| 41 | 48817 (462) | 1 | Power supply mylar insulator |
| 42 | 48831 (462) | 1 | Power cord caution label |
| 43 | 48971 (462) | 1 | Elbow fitting |
| 44 | 48835 (462) | 1 | Fuse label |
| 45 | 48834 (462) | 1 | Fuse label |
| 46 | 3912604 (462) | 1 | Locking nut |
| 47 | 4897001 (462) | 2 | Clamping screw (1/2") |
| 48 | 4897002 (462) | 2 | Clamping screw (1 1/2") |

**NOTES:**

## Caregiver Pendant

**Figure 5-3. Caregiver Pendant—P/N 48358**

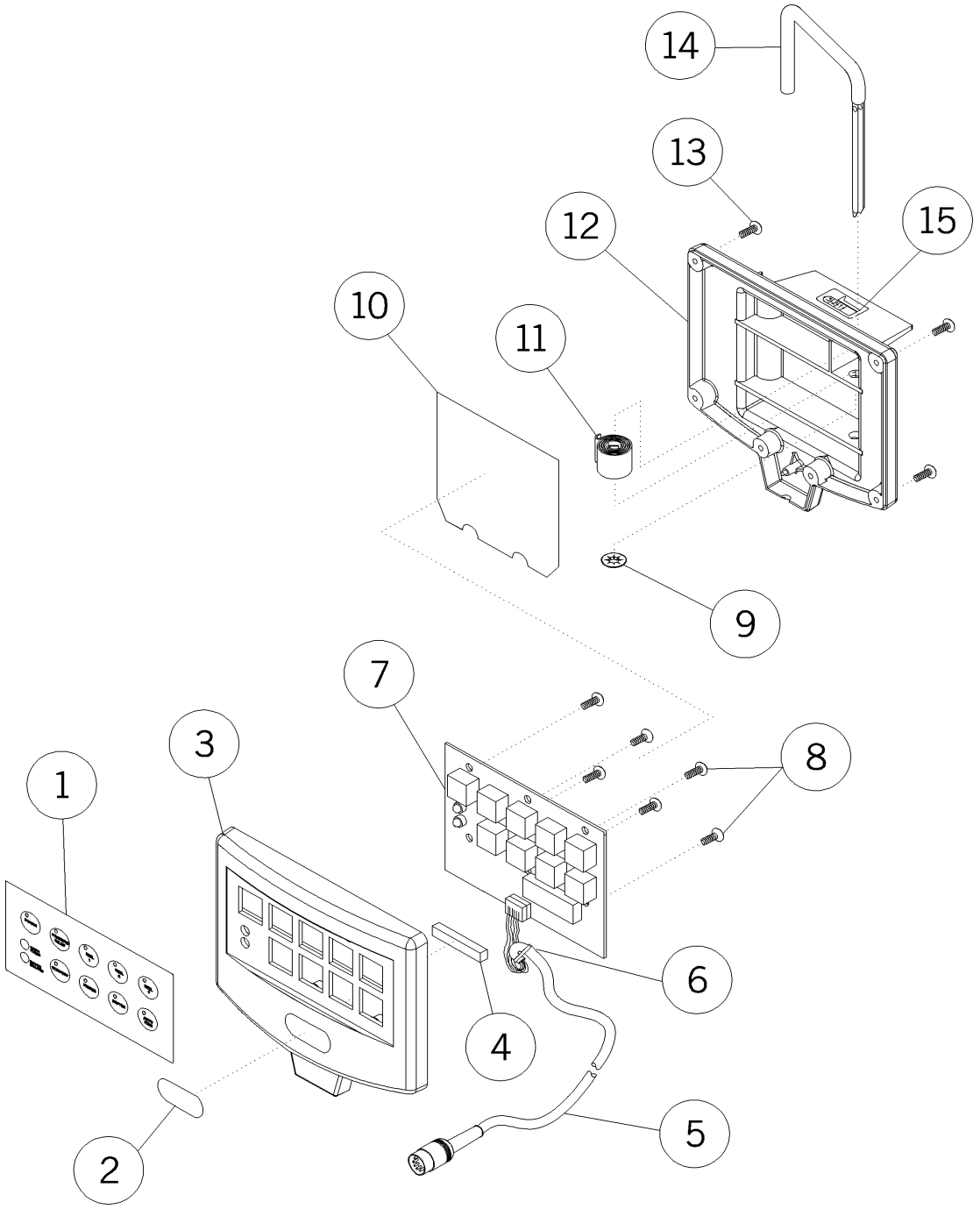


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**Table 5-2. Caregiver Pendant—P/N 48358**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | 48690 (462) | 1 | Caregiver pendant overlay |
| 2 | 48749 (462) | 1 | ZoneAire pendant label |
| 3 | 48602 (462) | 1 | Caregiver pendant front |
| 4 | 48816 (462) | 1 | Foam eprom retainer |
| 5 | 48754 (462) | 1 | Caregiver pendant cable assembly |
| 6 | 14450 (462) | 1 | Small cable tie |
| 7 | 46943 (462) | 1 | Caregiver pendant board assembly |
| 8 | 34683 (462) | 6 | Screw |
| 9 | 36800 (462) | 1 | Pushnut |
| 10 | 48818 (462) | 1 | Pendant mylar shield |
| 11 | 48670 (462) | 1 | Torsion spring |
| 12 | 48603 (462) | 1 | Caregiver pendant back |
| 13 | 9142 (462) | 6 | Screw |
| 14 | 48669 (462) | 1 | Caregiver pendant mount |
| 15 | 48762 (462) | 1 | Heel zone label |

## Patient Pendant Control

**Figure 5-4. Patient Pendant Control—P72901**

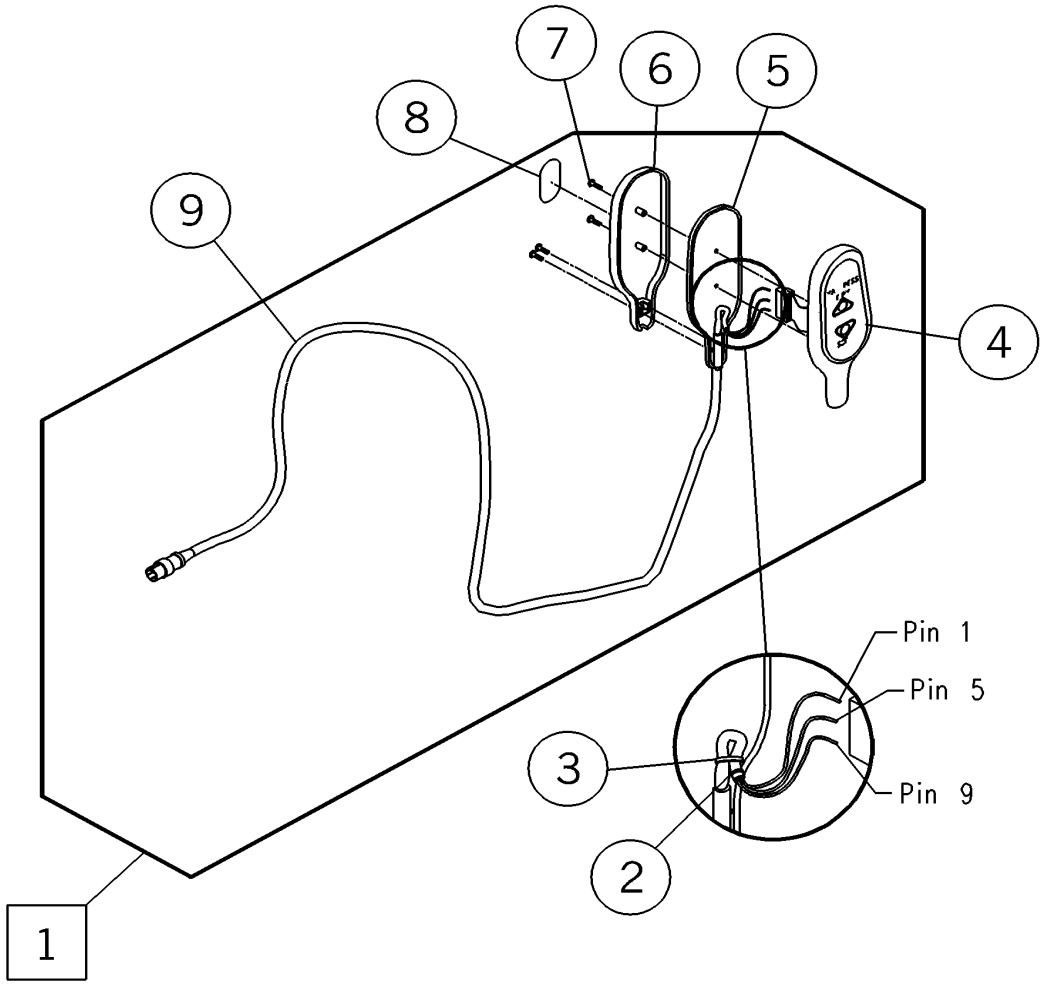


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**Table 5-3. Patient Pendant Control—P72901**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | P72901 (462) | 1 | Patient pendant |
| 2 | SA7341 (462) | 1 | Cable tie |
| 3 | 19124 (462) | 1 | Large cable tie |
| 4 | SA7346 (462) | 1 | Pendant control—front |
| 5 | SA7337 (462) | 1 | Compression boot |
| 6 | SA7338 (462) | 1 | Pendant control—back |
| 7 | SA7339 (462) | 4 | Screw |
| 8 | SA7340 (462) | 1 | Label |
| 9 | SA8689 (462) | 1 | Patient pendant cable |

# Power Supply Board Assembly—P/N 4471904

**Figure 5-5. Power Supply Board Assembly—P/N 4471904**

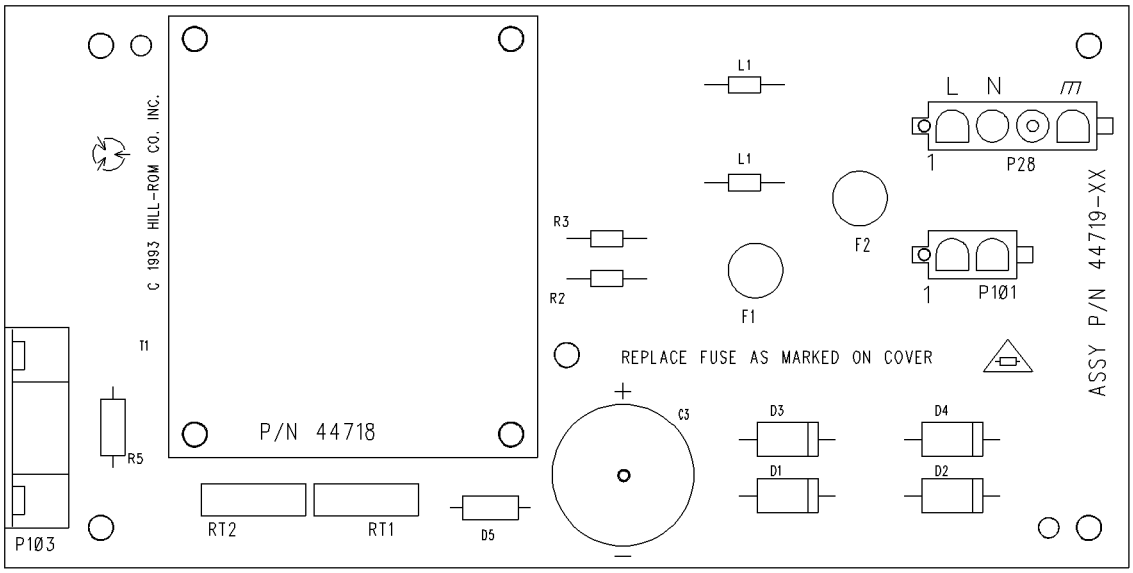


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**Table 5-4. Power Supply Board Assembly—P/N 4471904**

| Component Symbol | Part Number | Description |
|---|---|---|
| C3 | 43669-478 (462) | Capacitor |
| D1, D2, D3, D4 | 30210-5401B (462) | Diode |
| D5 | 30214-180A (462) | Tranzorb |
| F1 | 44714-08 (462) | Fuse |
| F2 | 44715-18 (462) | Fuse |
| L1, R2, R3 | 30016 (462) | Resistor |
| P28 | 4283504 (462) | UMNL header |
| P101 | 4314502 (462) | Socket header |
| P103 | 4867109 (462) | Connector |
| RT1, RT2 | 43618-03 (462) | PTC thermistor |
| R5 | 30007-152 (462) | Resistor |
| T1 | 43151 (462) | Transformer |

# Air Control Board—P/N 4476004

**Figure 5-6. Air Control Board—P/N 4476004**

TOP VIEW

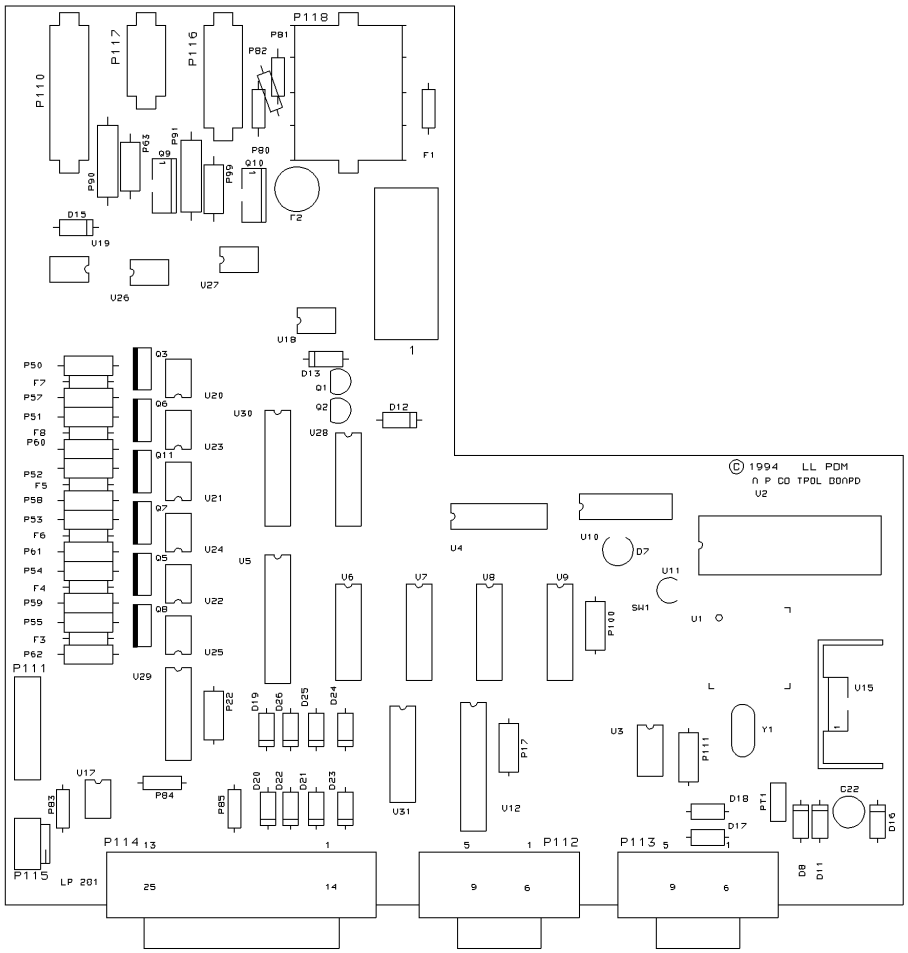


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**Figure 5-7. Air Control Board—P/N 4476004**

BOTTOM VIEW

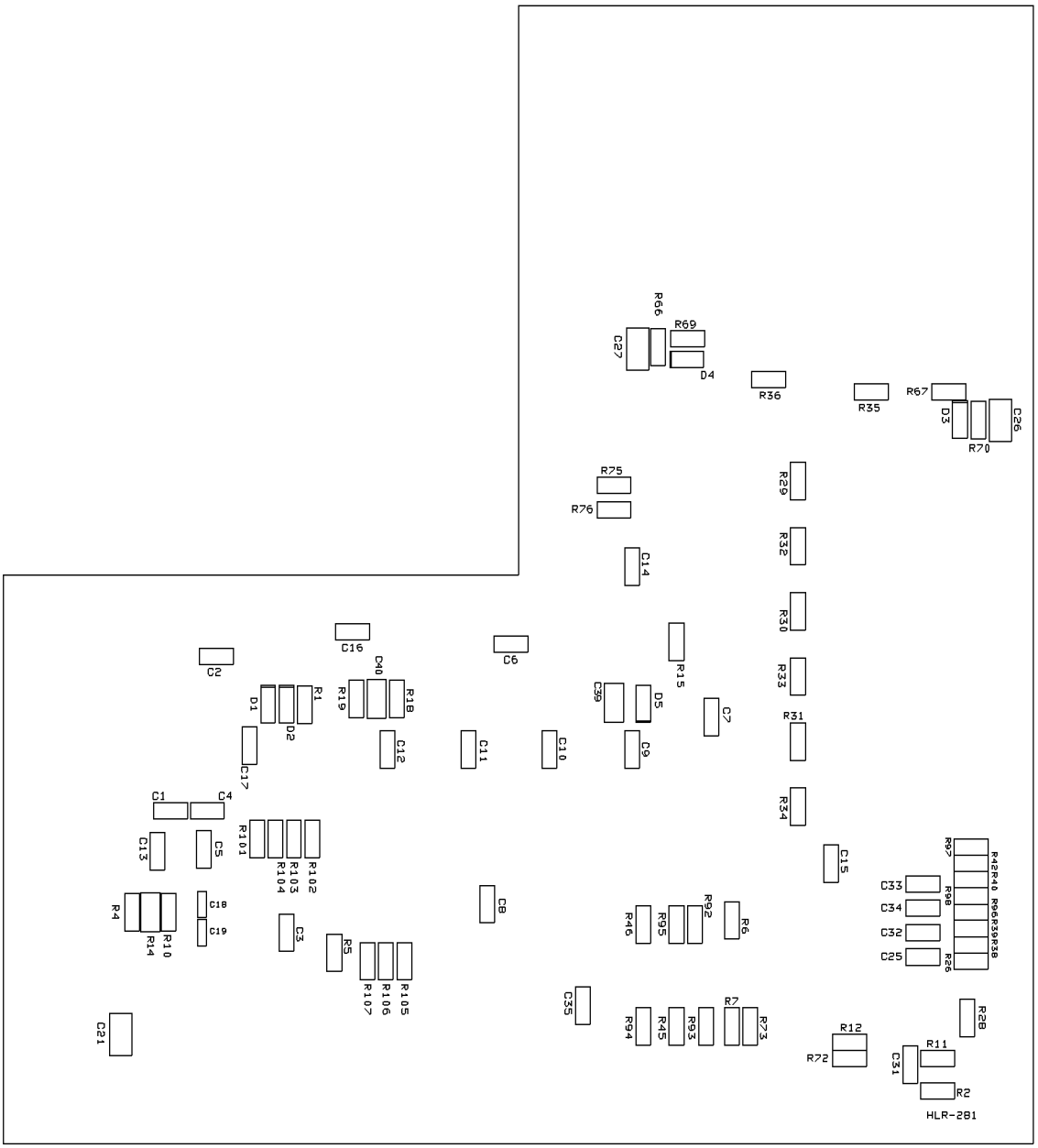


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**Table 5-5. Air Control Board—P/N 4476004**

| Component Symbol | Part Number | Description |
|---|---|---|
| C1-C17, C25, C31-C35 | 47642104K3C (462) | Capacitor |
| C21 | 47644334K3C (462) | Capacitor |
| C26,C27 | 47644474K3C (462) | Capacitor |
| C22 | 30125101M (462) | Capacitor |
| C18, C19 | 47641330J3A (462) | Capacitor |
| C39, C40 | 47643103K3A (462) | Capacitor |
| P112 | 4867109 (462) | Connector |
| P117 | 42835-02 (462) | Connector |
| P116 | 41543-02 (462) | Connector |
| P110 | 43145-04 (462) | Connector |
| P114 | 4867125 (462) | Connector |
| P111 | 43231-07 (462) | Connector, 7 position |
| P118 | 30965 (462) | Connector |
| D1, D2 | 47683BAS85 (462) | Diode |
| D7 | 30319 (462) | LED—red |
| D11-D13 | 30201-4003B (462) | Diode, silicon |
| D15 | 302014005B (462) | Diode |
| D8 | 30214-180A (462) | Tranzorb |
| D16-D26 | 30214-050A (462) | Diode |
| D3-D5 | 488564148 (462) | Diode |
| F1 | 4471612 (462) | Fuse |
| F2 | 4471415 (462) | Fuse |
| F2 | 48858 (462) | Socket, fuse |
| F3-F8 | 4471606 (462) | Fuse |
| K1 | 30707 (462) | Relay |
| Q1, Q2 | 303003904B (462) | Transistor |
| Q9, Q10 | 9000309 (462) | Triac |
| Q3, Q5-Q8, Q11 | 30323-01 (462) | Triac |
| R80, R81, R83, R85 | 30016 (462) | Resistor |
| R17, R22, R100 | 30007-101 (462) | Resistor |
| R1, R2, R6, R45, R46, R92-R95 | 47618102 (462) | Resistor |
| R4, R5, R7 | 47618103 (462) | Resistor |
| R10-R12, R26, R96-R98 | 47618104 (462) | Resistor |
| R40, R72, R73 | 47618474 (462) | Resistor |

| Component Symbol | Part Number | Description |
|---|---|---|
| R111 | 30007121 (462) | Resistor |
| R18 | 47618393 (462) | Resistor |
| R29-R36 | 47619151 (462) | Resistor |
| R66-R67 | 47618153 (462) | Resistor |
| R57-R63, R99 | 30024181 (462) | Resistor |
| R38, R39 | 47618222 (462) | Resistor |
| R19 | 47618753 (462) | Resistor |
| R14 | 47619271 (462) | Resistor |
| R69, R70 | 47618334 (462) | Resistor |
| R75, R76 | 47618472 (462) | Resistor |
| R50-R55 | 30007-472 (462) | Resistor |
| R90, R91 | 43619473 (462) | Resistor |
| R15, R42, R101-R107 | 47618473 (462) | Resistor |
| RT1 | 4382103 (462) | PTC |
| U6-U9 | 3041074HC17 (462) | Integrated circuit |
| U4 | 3041074HC13 (462) | Integrated circuit |
| U31 | 30410SP720A (462) | Integrated circuit |
| U28, U29 | 3040074HC14 (462) | Integrated circuit |
| U10 | 3040014541 (462) | Integrated circuit |
| U30 | 30414-2803A (462) | Integrated circuit |
| U5 | 3041874HC24 (462) | Integrated circuit |
| U12 | 3041874HC20 (462) | Integrated circuit |
| U20-U25 | 30420-3010 (462) | Integrated circuit |
| U26, U27 | 304453061TV (462) | Integrated circuit |
| U2 | 4892804s (462) | OTP assembly |
| -- | 3049928 (462) | Socket |
| U18 | 304468101 (462) | Integrated circuit |
| U19 | 304468101TV (462) | Integrated circuit |
| U15 | 4869503s (462) | Regulator assembly |
| U11 | 30477 (462) | Integrated circuit |
| U1 | 478003150 (462) | Integrated circuit |
| U3 | 30478 (462) | Integrated circuit |
| Y1 | 4836710R0D9 (462) | Crystal |
| YX1 | 48701 (462) | Component standoff |
| -- | 40776 (462) | Label |
| -- | 44759 (462) | Printed circuit board |

# Sensor Control Board Assembly—P/N 44740

**Figure 5-8. Sensor Control Board Assembly—P/N 44740**

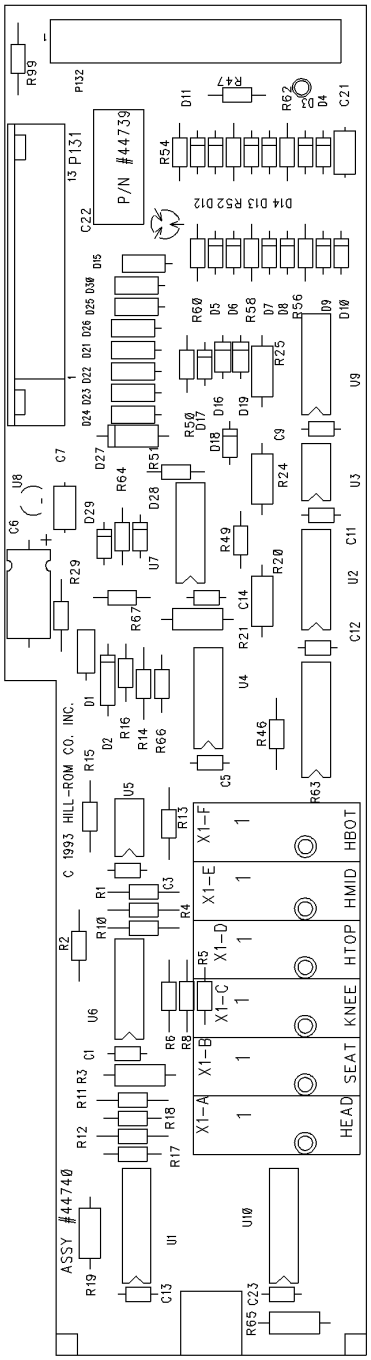


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**Table 5-6. Sensor Control Board Assembly—P/N 44740**

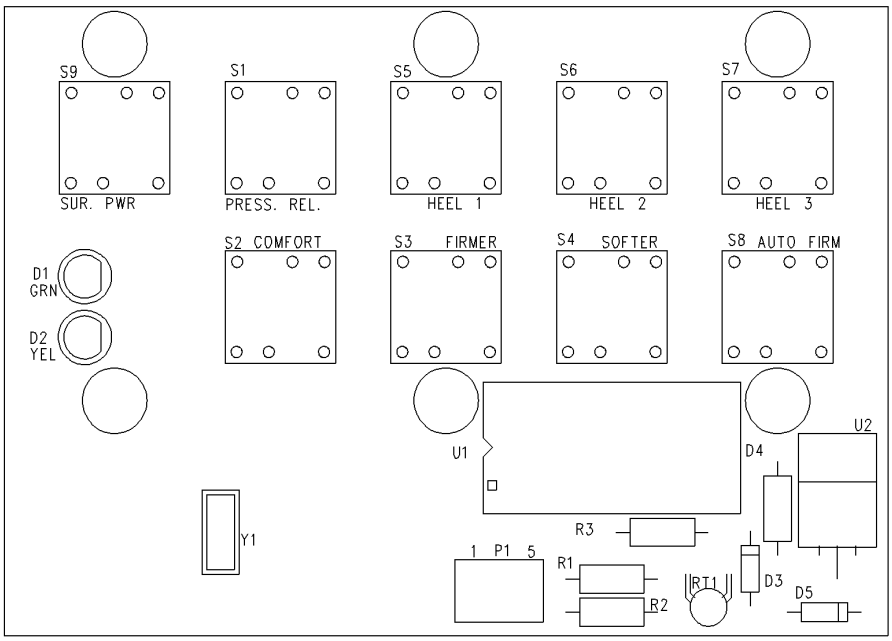
| Component Symbol | Part Number | Description |
|---|---|---|
| C1, C3, C5, C9, C11-C14, C23 | 30109-473K (462) | Capacitor |
| C6 | 30108 (462) | Capacitor formed |
| C7, C21 | 30109-104K (462) | Capacitor |
| C22 | 30129-105K1 (462) | Capacitor |
| D1, D15, D21-D26, D30 | 30214-050A (462) | Diode |
| D2 | 30201-4003B (462) | Diode silicon |
| D3-D14, D17, D18, D28, D29 | 30200-4148B (462) | Diode silicon |
| D16, D19 | 30208-5230B (462) | Diode |
| D27 | 30214-180A (462) | Tranzorb |
| P131 | 44713-25 (462) | Connector |
| P132 | 44818-13 (462) | Connector header |
| R1 | 30019-1623 (462) | Resistor |
| R2 | 30019-1023 (462) | Resistor |
| R3, R19, R20, R21, R24, R25, R65 | 30007-101 (462) | Resistor |
| R4, R6, B8, R10, R12, R15-R18 | 30019-2103 (462) | Resistor |
| R5 | 30019-1651 (462) | Resistor |
| R11, R13 | 30019-1053 (462) | Resistor |
| R14 | 30019-7502 (462) | Resistor |
| R29, R99 | 30016 (462) | Resistor |
| R46 | 30019-1372B (462) | Resistor |
| R47, R52, R54, R56, R58, R60, R62, R64 | 30006-103 (462) | Resistor |
| R49, R50 | 30006-620 (462) | Resistor |
| R51, R66 | 30006-102 (462) | Resistor |
| R63 | 45015-103 (462) | Resistor |
| R67 | 30006-104 (462) | Resistor |
| U1, U10 | 30410HC4051 (462) | Analog multiplexer |
| U2 | 3040074HC16 (462) | Integrated circuit |
| U3 | 30412-93C14 (462) | Integrated circuit |
| U4 | 30402-0834C (462) | Integrated circuit |
| U5 | 304066482IN (462) | Integrated circuit |
| U6 | 30402-LM324 (462) | Integrated circuit |

| Component Symbol | Part Number | Description |
|---|---|---|
| U7, U9 | 3040074HC14 (462) | Integrated circuit |
| U8 | 30312-2931 (462) | Integrated circuit |
| X1 | 44741 (462) | Pressure sensor assembly |

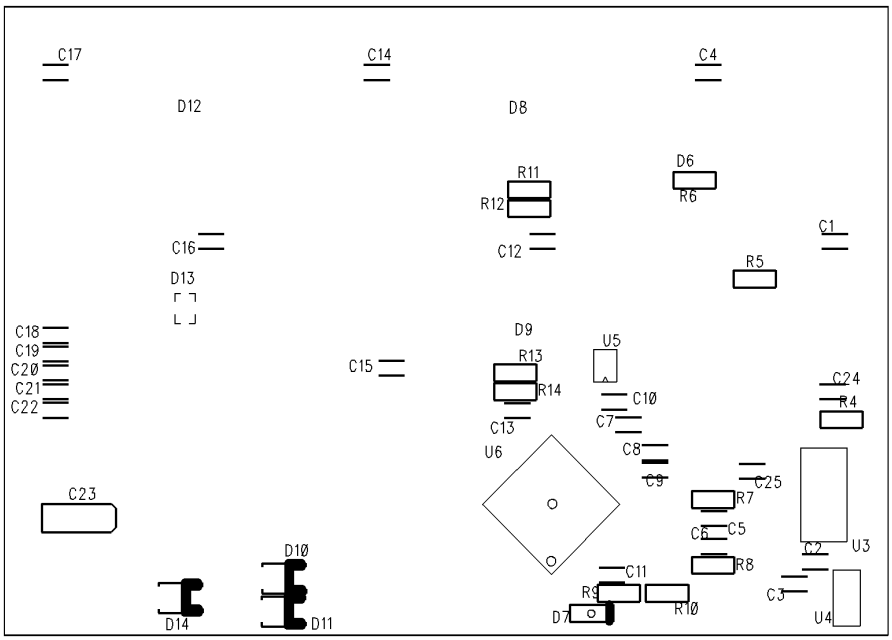
**NOTES:**

# Caregiver Pendant Board Assembly—P/N 46943

**Figure 5-9. Caregiver Pendant Board Assembly—P/N 46943**




TOP VIEW




BOTTOM VIEW

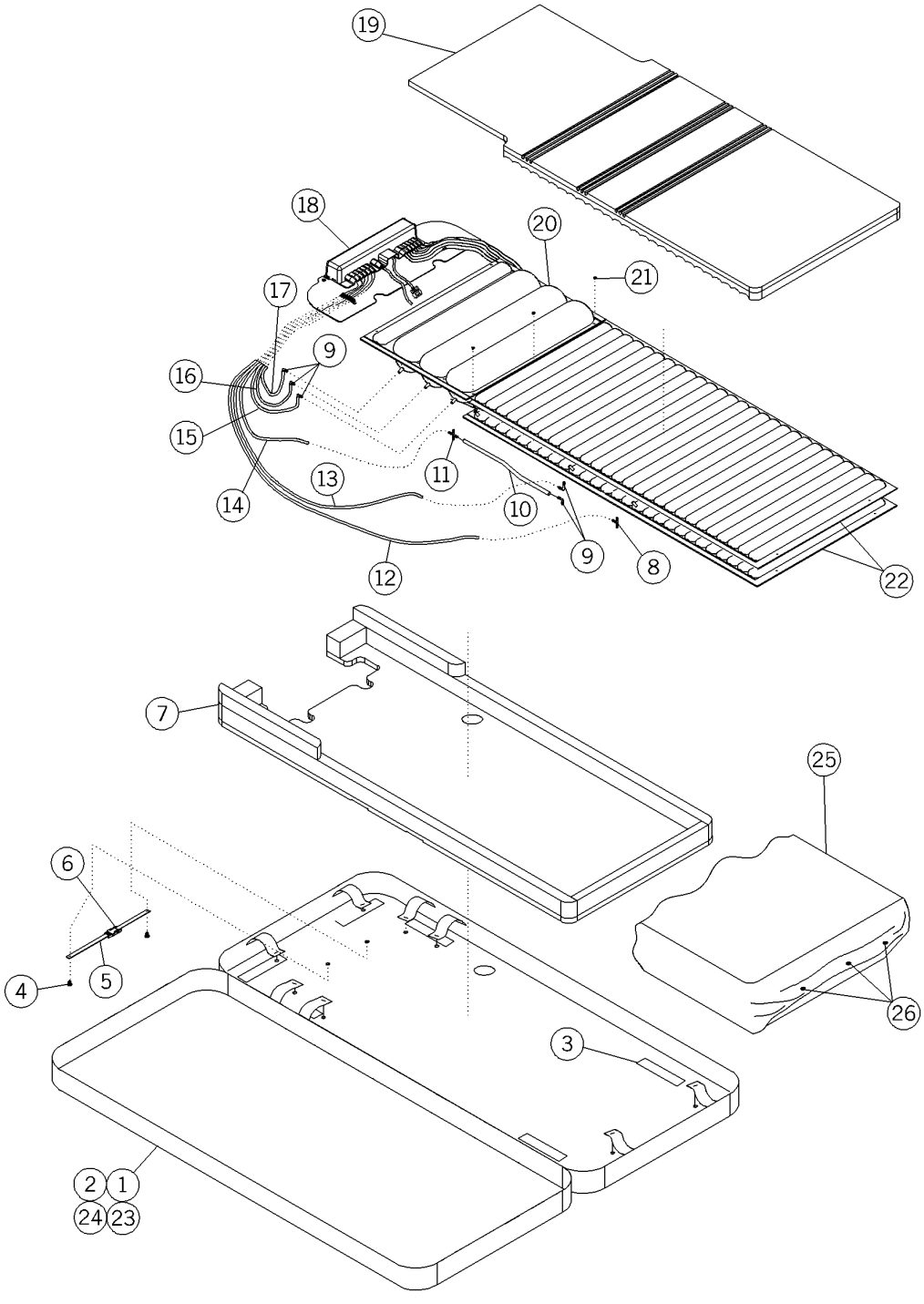
m121_033

**Table 5-7. Caregiver Pendant Board Assembly—P/N 46943**

| Component Symbol | Part Number | Description |
|---|---|---|
| C1-C4, C7-C22, C24, C25 | 47641104K3C (462) | Capacitor |
| C5, C6 | 47641330J3A (462) | Capacitor |
| C23 | 47662226M1 (462) | Capacitor |
| D1 | 305055 (462) | LED—green |
| D2 | 305056 (462) | LED—yellow |
| D4 | 30214-180A (462) | Tranzorb |
| D3, D5 | 30201-4003B (462) | Diode, silicon formed |
| D7 | 4792001 (462) | LED—red |
| D10, D11, D14 | 47681050 (462) | Diode |
| D6, D8, D9, D12, D13 | 47682BAT74 (462) | Diode |
| P1 | 4447805 (462) | Connector |
| RT1 | 4361801 (462) | Resistor |
| R1 | 30007-101 (462) | Resistor |
| R2, R3 | 30007100 (462) | Resistor |
| R4 | 47618332 (462) | Resistor |
| R5, R9 | 47618301 (462) | Resistor |
| R6, R10-R14 | 47618103 (462) | Resistor |
| R7 | 47618104 (462) | Resistor |
| R8 | 47618471 (462) | Resistor |
| S1-S9 | 48359A3A (462) | Switch |
| U1 | 45795256200 (462) | Eprom |
| U2 | 48714 (462) | Regulator |
| U3 | 4770914489 (462) | Display driver |
| U4 | 477131233Z1 (462) | Reset |
| U5 | 4770075176 (462) | Transceiver |
| U6 | 478003150 (462) | Neuron |
| Y1 | 483675R00D (462) | Crystal |
| -- | 48701 (462) | Component standoff |
| -- | 4846228A (462) | Film socket |

# Sleep Surface Mattress Assembly—P1412CA01,02 & P1412EA01,02

**Figure 5-10. Sleep Surface Mattress Assembly—P1412CA01,02 & P1412EA01,02**



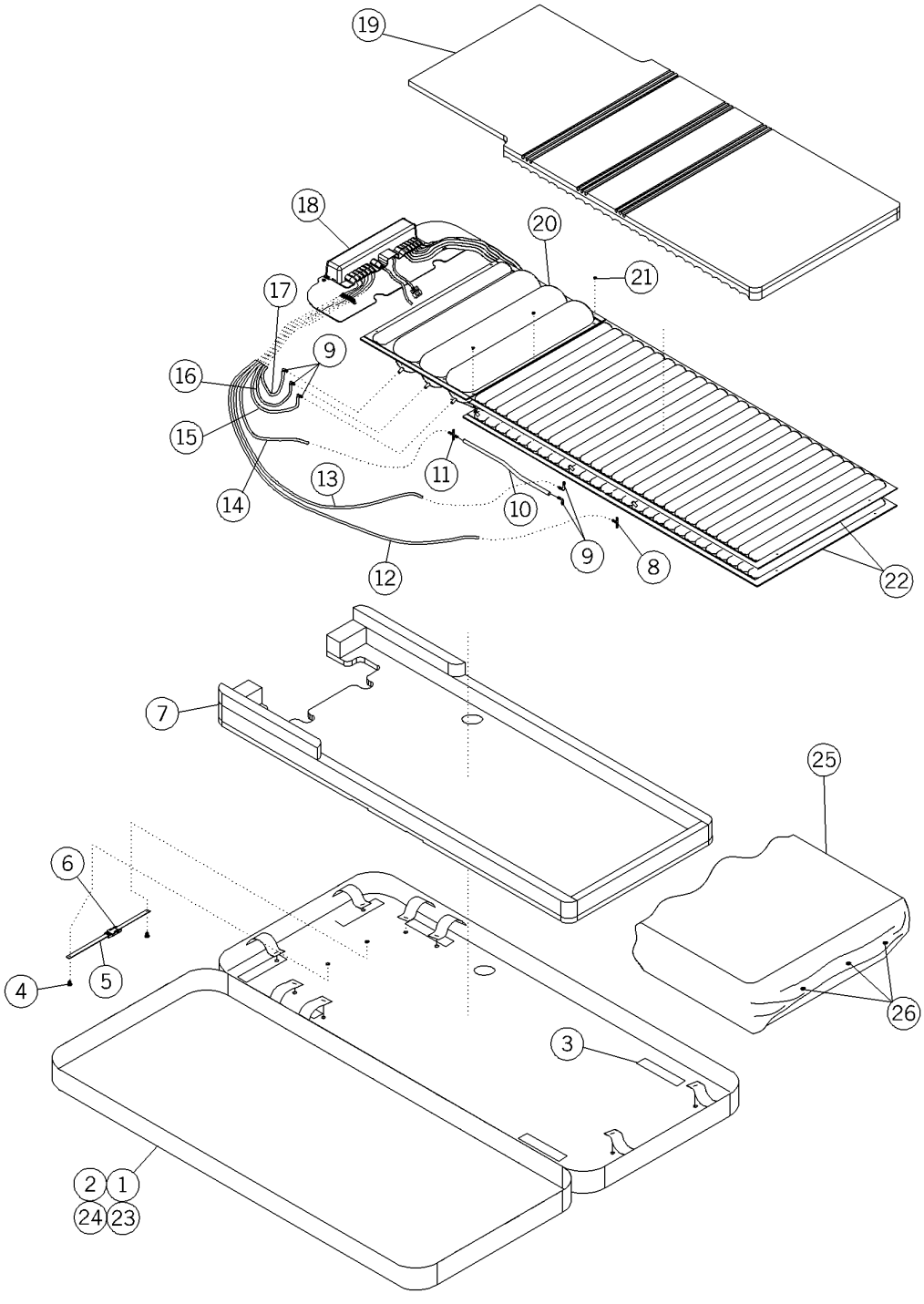

m121_006

**Table 5-8. Sleep Surface Mattress Assembly—P1412CA01,02 & P1412EA01,02**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | SA8651 (462) | 1 | Comfort ticking—blue |
| 2 | SA8652 (462) | 1 | Ultron ticking—green |
| 3 | SA4589 (462) | 6 | Magnet |
| 4 | SA7395 (462) | 2 | Push rivet |
| 5 | SA7397 (462) | 1 | Strap with buckle insert |
| 6 | SA7396 (462) | 1 | Strap with buckle catch |
| 7 | SA8653 (462) | 1 | Bottom foam |
| 8 | SA7414 (462) | 2 | Tee connector |
| 9 | SA7402 (462) | 10 | Elbow connector |
| 10 | SA7411 (462) | 2 | Tubing, thigh/seat section |
| 11 | SA7410 (462) | 2 | Cross connector |
| 12 | SA7413 (462) | 2 | Tubing, head section, main bladder |
| 13 | SA7412 (462) | 2 | Tubing, seat section, main bladder |
| 14 | SA7409 (462) | 2 | Tubing, thigh section |
| 15 | SA7408 (462) | 2 | Tubing, heel bladder, zone 1 |
| 16 | SA7407 (462) | 2 | Tubing, heel bladder, zone 2 |
| 17 | SA7405 (462) | 2 | Tubing, heel bladder, zone 3 |
| 18 | 4567901 (462) | 1 | Surface control module |
| 19 | SA8654 (462) | 1 | Top foam |
| 20 | SA8655 (462) | 1 | Heel bladder |
| 21 | SA7400 (462) | 3 | Snap rivet—male |
| 22 | SA8656 (462) | 2 | Main bladder, upper/lower |
| 23 | SA8657 (462) | 1 | Comfort ticking—blue |
| 24 | SA8658 (462) | 1 | Ultron ticking—green |
| 25 | SA8698 (462) | 1 | Flame retardant liner |
| 26 | SA8699 (462) | 6 | T-end fastener |

# Sleep Surface Mattress Assembly—P1414CA01,02 & P1414EA01,02

**Figure 5-11. Sleep Surface Mattress Assembly—P1414CA01,02 & P1414EA01,02**




m121_006

**Table 5-9. Sleep Surface Mattress Assembly—P1414CA01,02 & P1414EA01,02**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | SA8659 (462) | 1 | Comfort ticking |
| 2 | SA8660 (462) | 1 | Ultron ticking |
| 3 | SA4589 (462) | 6 | Magnet |
| 4 | SA7395 (462) | 2 | Push rivet |
| 5 | SA7397 (462) | 1 | Strap with buckle insert |
| 6 | SA7396 (462) | 1 | Strap with buckle catch |
| 7 | SA8667 (462) | 1 | Bottom foam |
| 8 | SA7414 (462) | 2 | Tee connector |
| 9 | SA7402 (462) | 10 | Elbow connector |
| 10 | SA8675 (462) | 2 | Tubing, thigh/seat section |
| 11 | SA7410 (462) | 2 | Cross connector |
| 12 | SA8677 (462) | 2 | Tubing, head section, main bladder |
| 13 | SA8679 (462) | 2 | Tubing, seat section, main bladder |
| 14 | SA8681 (462) | 2 | Tubing, thigh section |
| 15 | SA8683 (462) | 2 | Tubing, heel bladder, zone 1 |
| 16 | SA8685 (462) | 2 | Tubing, heel bladder, zone 2 |
| 17 | SA8687 (462) | 2 | Tubing, heel bladder, zone 3 |
| 18 | 4567901(462) | 1 | Surface control module |
| 19 | SA8669 (462) | 1 | Top foam |
| 20 | SA8671 (462) | 1 | Heel bladder |
| 21 | SA7400 (462) | 3 | Snap rivet—male |
| 22 | SA8673 (462) | 2 | Main bladder, upper/lower |
| 23 | SA8661 (462) | 1 | Comfort ticking |
| 24 | SA8662 (462) | 1 | Ultron ticking |
| 25 | SA8700 (462) | 1 | Flame retardant liner |
| 26 | SA8701 (462) | 6 | T-end fastener |

# Sleep Surface Mattress Assembly—P1416CA01,02 & P1416EA01,02

**Figure 5-12. Sleep Surface Mattress Assembly—P1416CA01,02 & P1416EA01,02**

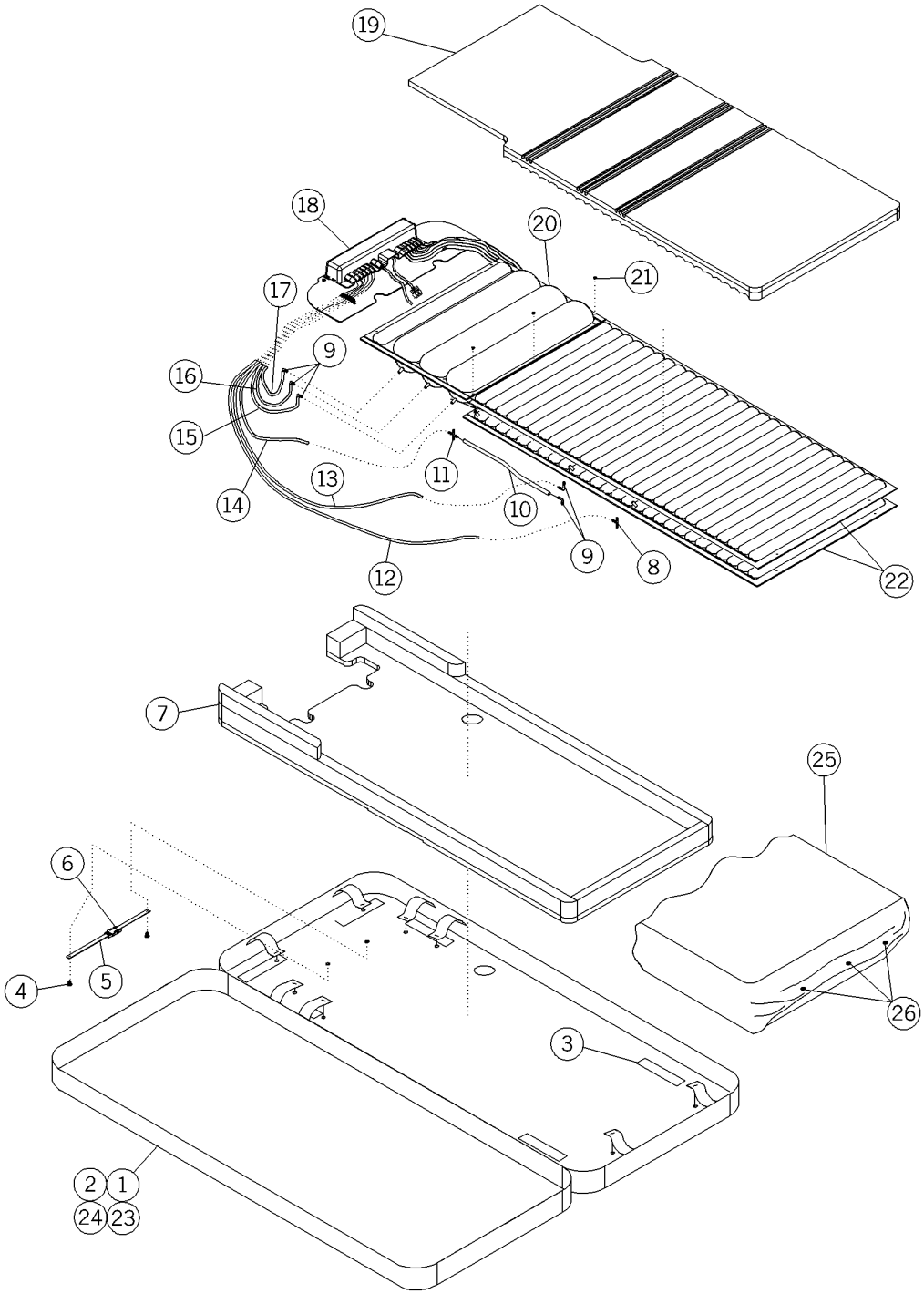


**Table 5-10. Sleep Surface Mattress Assembly—P1416CA01,02 & P1416EA01,02**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | SA8663 (462) | 1 | Comfort ticking |
| 2 | SA8664 (462) | 1 | Ultron ticking |
| 3 | SA4589 (462) | 6 | Magnet |
| 4 | SA7395 (462) | 2 | Push rivet |
| 5 | SA7397 (462) | 1 | Strap with buckle insert |
| 6 | SA7396 (462) | 1 | Strap with buckle catch |
| 7 | SA8668 (462) | 1 | Bottom foam |
| 8 | SA7414 (462) | 2 | Tee connector |
| 9 | SA7402 (462) | 10 | Elbow connector |
| 10 | SA8676 (462) | 2 | Tubing, thigh/seat section |
| 11 | SA7410 (462) | 2 | Cross connector |
| 12 | SA8678 (462) | 2 | Tubing, head section, main bladder |
| 13 | SA8680 (462) | 2 | Tubing, seat section, main bladder |
| 14 | SA8682 (462) | 2 | Tubing, thigh section |
| 15 | SA8684 (462) | 2 | Tubing, heel bladder, zone 1 |
| 16 | SA8686 (462) | 2 | Tubing, heel bladder, zone 2 |
| 17 | SA8688 (462) | 2 | Tubing, heel bladder, zone 3 |
| 18 | 4567901 (462) | 1 | Surface control module |
| 19 | SA8670 (462) | 1 | Top foam |
| 20 | SA8672 (462) | 1 | Heel bladder |
| 21 | SA7400 (462) | 3 | Snap rivet—male |
| 22 | SA8674 (462) | 2 | Main bladder, upper/lower |
| 23 | SA8665 (462) | 1 | Comfort ticking |
| 24 | SA8666 (462) | 1 | Ultron ticking |
| 25 | SA8702 (462) | 1 | Flame retardant liner |
| 26 | SA8703 (462) | 6 | T-end fastener |

## Sleep Surface Control Module Assembly

**Figure 5-13. Sleep Surface Control Module Assembly**

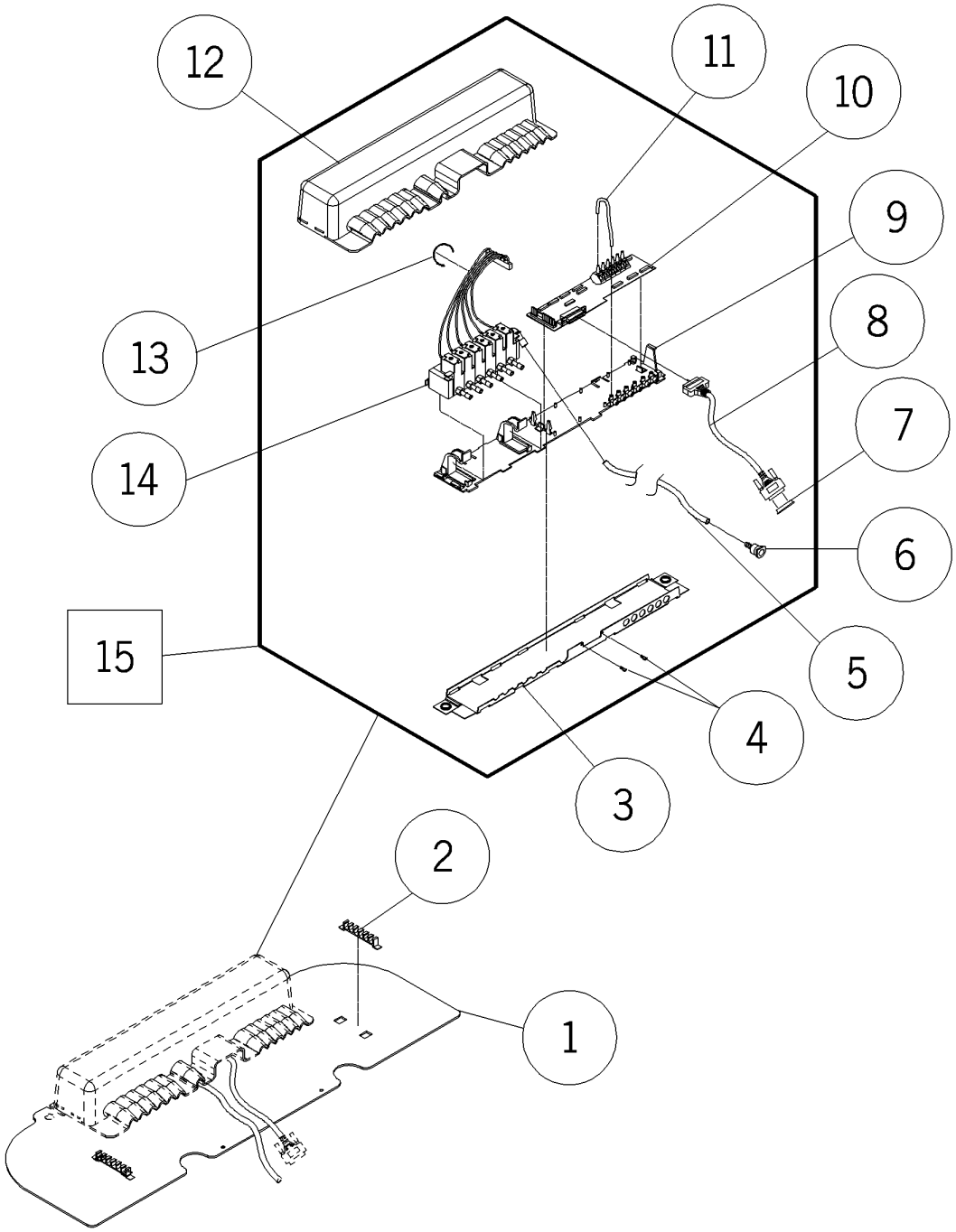



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**Table 5-11. Sleep Surface Control Module Assembly**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | SA7404 (462) | 1 | Locator plate |
| 2 | SA7403 (462) | 2 | Tubing clamp |
| 3 | 47610pl (462) | 1 | Surface control base |
| 4 | 28968 (462) | 2 | Screw lock |
| 5 | 4875601 (462) | 1 | Tube |
| 6 | 45846 (462) | 1 | Quick coupling—female |
| 7 | 45955 (462) | 1 | Connector cover |
| 8 | 4557302 (462) | 1 | Sensor cable—mattress |
| 9 | 45598 (462) | 1 | Surface control frame |
| 10 | 44740 (462) | 1 | Sensor control board |
| 11 | 45682 (462) | 6 | Flex tubing |
| 12 | 45649 (462) | 1 | Surface control cover |
| 13 | 14450 (462) | 1 | Small cable tie |
| 14 | 45631 (462) | 1 | Surface control valves |
| 15 | 4567901 (462) | 1 | Surface control module |

## Trapeze Support Adapter—P844A02

**Figure 5-14. Trapeze Support Adapter—P844A02**

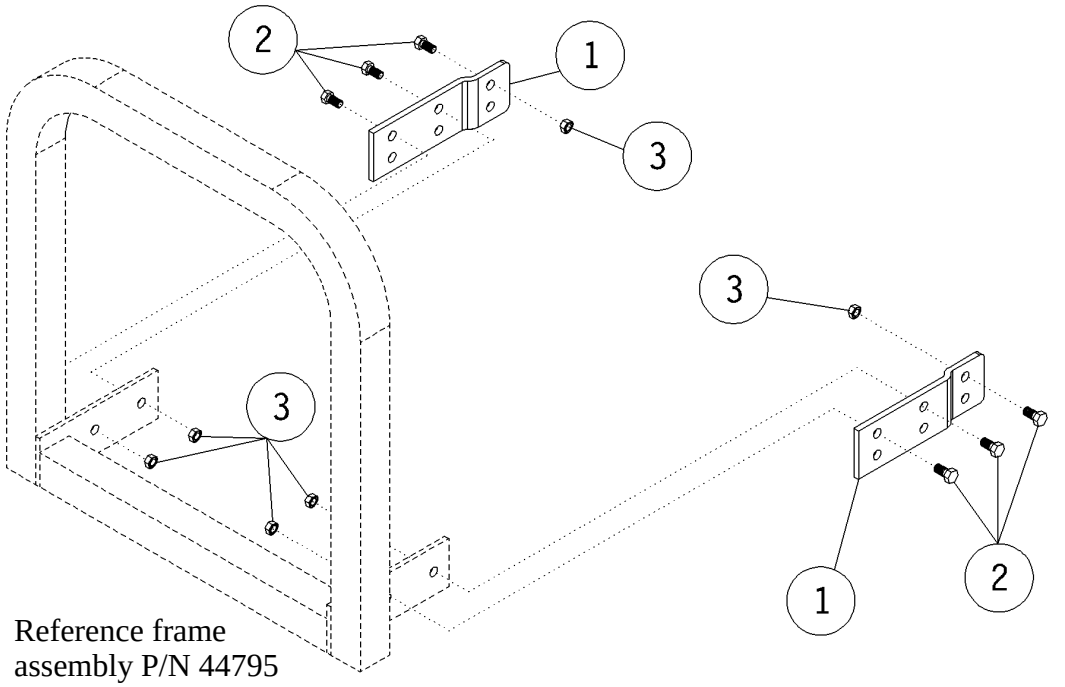


**Table 5-12. Trapeze Support Adapter—P844A02**

| Item Number | Part Number | Quantity | Description |
|---|---|---|---|
| 1 | 4894848 (462) | 2 | Trapeze adapter bracket |
| 2 | 90017-20 (462) | 6 | Hex head bolt |
| 3 | 9013221 (462) | 6 | Hex nut |

# Chapter 6
# General Procedures

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6

**NOTES:**

## 6.1 Installing on a Retractable Bed Frame

This procedure provides installation and removal instructions for the following bed frames:

- Advance series bed (3 motor): 1100, 1110, 1120, 1130, 1140
- Advance series bed (4 motor): 1105, 1115, 1135, 1145
- *840 and 850 series bed: 840, 842, 850, 852, 8400, 8500
- Centra bed (4 motor): 1060, 1061, 1062, 1063, 1064

  * SA1160 Panel adapter assembly must be used with the 840 series bed.

Tools required:
Wire cutting pliers
Tape measure
Standard household cleaner
Permanent marker

Parts required:

| | | |
|---|---|---|
| (1) | P1412CA01 | ZoneAire Sleep Surface, 35" x 84", Staphchek Comfort mattress ticking |
| | or | |
| | P1412CA02 | ZoneAire Sleep Surface, 35" x 84", Ultron ticking |
| | or | |
| | P1412EA01 | ZoneAire Sleep Surface, 35" x 84", Staphchek Comfort mattress ticking (flame retardant) |
| | or | |
| | P1412EA02 | ZoneAire Sleep Surface, 35" x 84", Ultron ticking (flame retardant) |
| (1) | 48358 | Caregiver pendant assembly |
| (1) | 46920s | Power unit assembly |
| (1) | P72901 | Patient pendant (optional) |
| (1) | 48811 | Wire tie packet |
| (3) | 48694 | Tie holder |
| (2) | 4897001 | Clamping screw (1/2") |
| (2) | 4897002 | Clamping screw (1 1/2") |

## Installation

**CAUTION:**
Hill-Rom does not recommend using the bed exit system in conjunction with the ZoneAire Sleep Surface System when the mattress is installed on beds with a spring fabric deck.

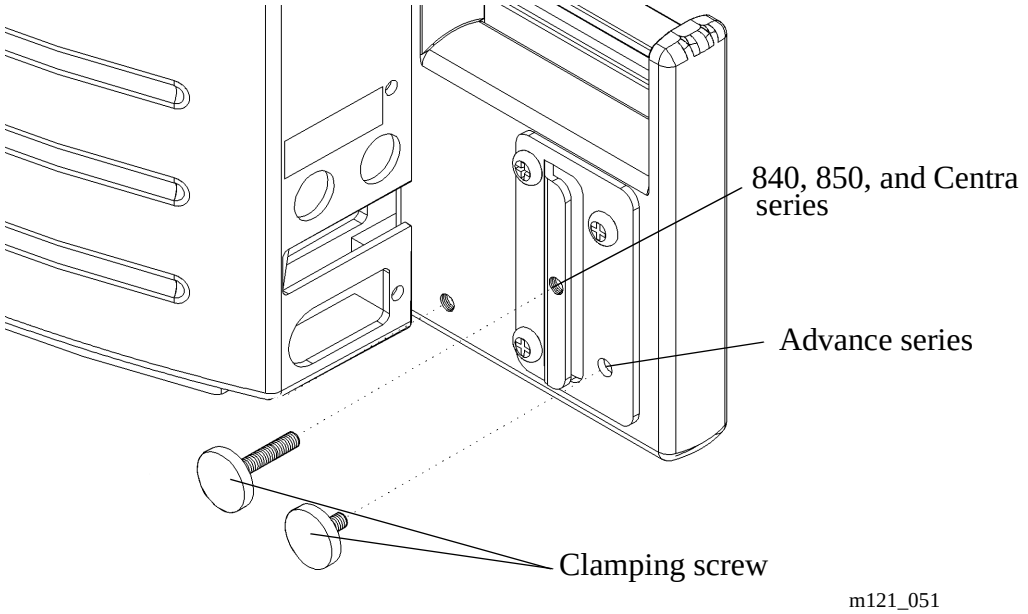
1. If the bed is equipped with a DynamicAire Sleep Surface System, make sure its air power switch is in the off position.

2. Remove the existing mattress and headboard from the bed.

3. Raise the bed to its highest position, and put the surface in the flat position.

4. Put the power unit on the bed in place of the headboard. Position the clamping screws, located on the front of the power unit, in the proper pair of threaded holes (see figure 6-1 on page 6-4).

**Figure 6-1. Clamping Screws**



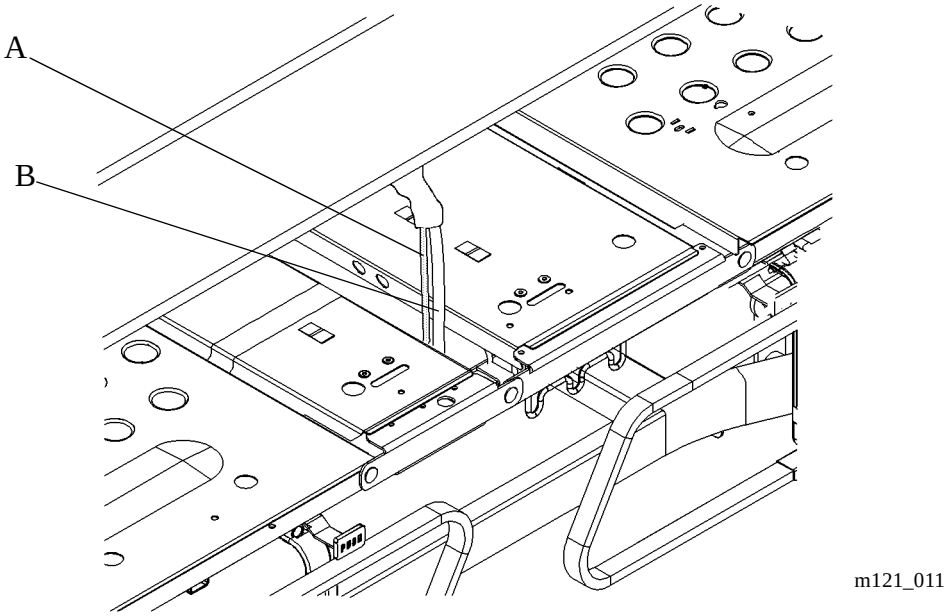

5. Tighten the appropriate clamping screws to secure the power unit to the headboard posts.

**NOTE:**
Use the clamping screws with the long threads on beds equipped with bayonet mounting posts.

6. Put the ZoneAire Sleep Surface System mattress on the bed with the white heel zone locator buttons at the foot end.

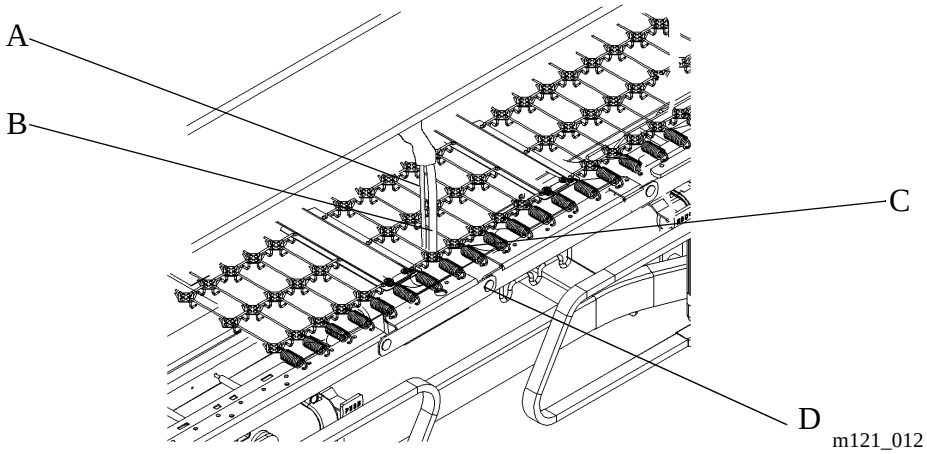
7. **If your bed is equipped with a hard panel sleep surface, complete this step. Otherwise, go to step 8**. Route the mattress power cable (A) and mattress air tube (B) exiting the mattress surface, between the thigh and seat sections of the bed (see figure 6-2 on page 6-5). Locate the cable and air hose approximately 10" from the surface edge on the patient's right side.

**Figure 6-2. Bed Equipped With a Hard Panel Sleep Surface**




8. **If your bed is equipped with a spring fabric sleep surface, complete this step. Otherwise, return to step 7.** Route the mattress power cable (A) and mattress air tube (B) exiting the mattress surface, between the thigh and seat sections of the bed, and through the first large opening (C) across from the pivot (D) (see figure 6-3 on page 6-6). Locate the power cable and air tube approximately 10" from the surface edge on the patient's right side.

**Figure 6-3. Bed Equipped With a Spring Fabric Sleep Surface**

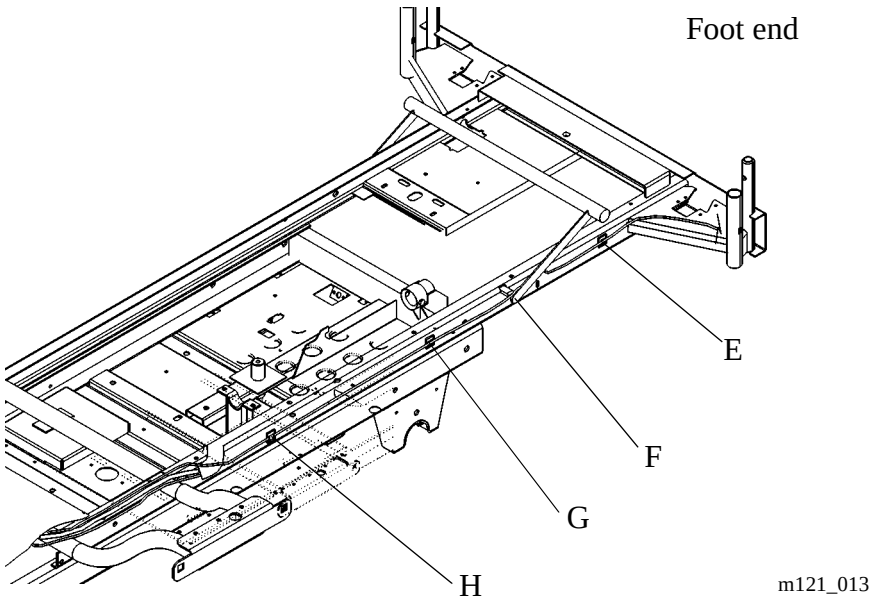



9. Unplug the bed from its power source.

10. Raise both right siderails and lock in the upright position.

11. Using a standard household cleaner, clean the areas where the three wire tie holders (E), (G), and (H) will be installed (see figure 6-4 on page 6-6). Dry the areas thoroughly before you install the wire tie holders on the retracting frame.

**Figure 6-4. Retractable Bed Wire Tie Holder Location**

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**NOTE:**
Make sure you clean and dry the frame surface thoroughly for better wire tie holder adhesion.

12. Measure 8" from the foot rack pivot (F) toward the foot end of the bed, and put one wire tie holder on the retracting frame at location (E).

**NOTE:**
Make sure the wire tie holders are installed with the wire tie slot in a vertical orientation.

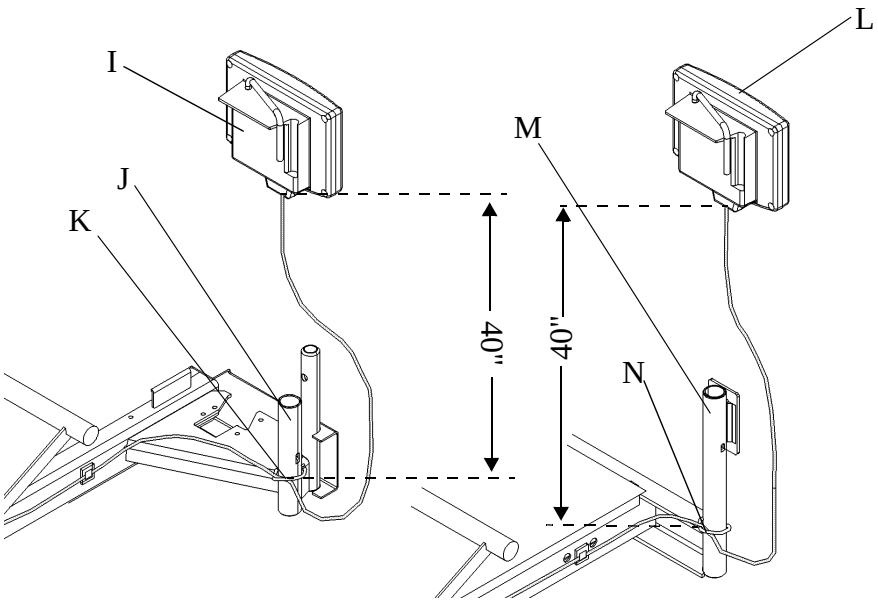
13. Measure 8" from the foot rack pivot (F) toward the head end of the bed, and place one wire tie holder on the retracting frame at location (G).

14. Measure 22" from the foot rack pivot (F) toward the head end of the bed, and place one wire tie holder on the retracting frame at location (H).

15. Put the caregiver pendant on the top of the footboard on the patient's right side.

16. **Complete this step for Advance and Centra series bed frames only**. From the base of the caregiver pendant (I), measure 40" along the pendant cable and with a permanent marker, mark the 40" point. Using a red wire tie, at the 40" mark (K), secure the caregiver pendant cable to the IV rod holder (J) located at the foot end of the bed on the patient's right side (see figure 6-5 on page 6-8).

**Figure 6-5. Retractable Bed Cable Routing**




17. **Complete this step for 840 and 850 bed frames only**. From the base of the caregiver pendant (L), measure 40" along the pendant cable and with a permanent marker, mark the 40" point. Using a red wire tie, at the 40" mark (N), secure the caregiver pendant cable to the footboard post (M) located at the foot end of the bed on the patient's right side (see figure 6-5 on page 6-8).

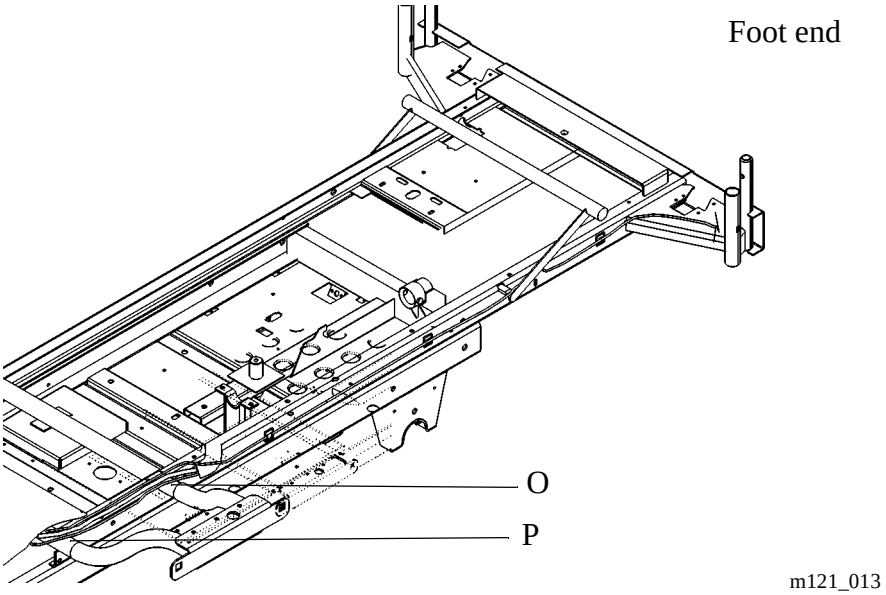
18. Route the caregiver pendant cable along the frame. Using the red wire ties, secure the caregiver pendant cable to the three wire tie holders (E), (G), and (H). Make sure the cable is routed on the inside of the pivot arm (F)(see figure 6-4 on page 6-6).

**CAUTION:**
Make sure the caregiver pendant cable is routed over the foot rack pivot.

19. Route the caregiver pendant cable, the mattress power cable, and the mattress air tube over the seat section cross tubes (O) and (P) (see figure 6-6 on page 6-9) and over the head section cross tube (Q) (see figure 6-7 on page 6-10).

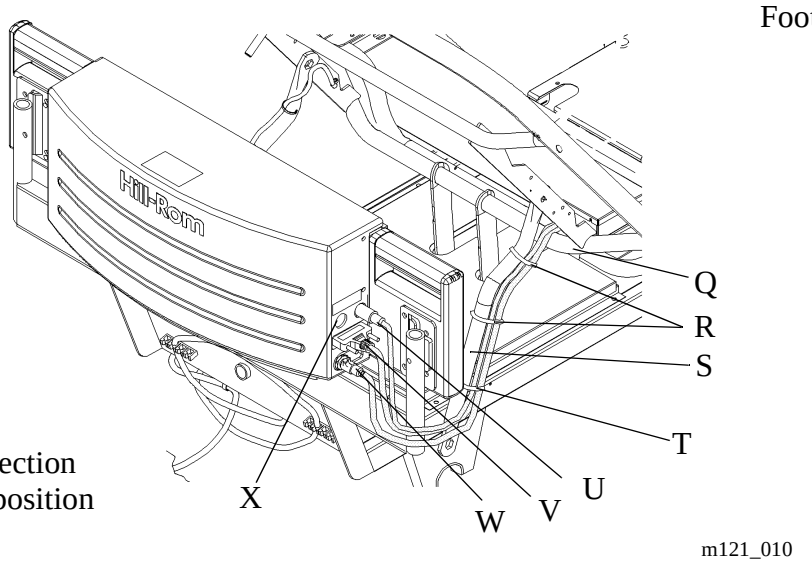
**CAUTION:**
The wire ties should be snug enough to hold the cables and the air tube in place but not so snug as to kink or compress the air tube and restrict airflow.

**Figure 6-6. Cable and Hose Bundle Routing**




20. Using the red cable ties, secure the caregiver pendant cable, the mattress power cable, and the mattress air tube to the seat section cross tubes (O) and (P) (see figure 6-6 on page 6-9).

**Figure 6-7. Cable Routing and Connection**




**NOTE:** The head section is shown in the up position for clarity.

21. Route the caregiver pendant cable, the mattress power cable, and the mattress air tube along the arm assembly (S). Using the red cable ties, secure the cable and hose bundle to locations (R) and (T).

**NOTE:**
Make sure the cable and hose bundle are located on the bottom side of the arm assembly (S).

22. Connect the sleep surface air tube (W) to the quick coupling on the power unit assembly.

23. Connect the sleep surface power cable connector (V) to the 25 pin connector on the power unit assembly.

24. Connect the caregiver pendant cable connector (U) to the gray ringed connector on the power unit assembly.

25. Plug the bed into an appropriate power source.

26. While observing the cable, especially in the head section area, move the head section to the full up position. Make sure that there is enough slack in the cables and air hose for bed articulation.

27. Plug the power unit into an appropriate power source.

28. If a patient pendant is provided, connect it to the black ringed plug (X) on the power unit assembly (see figure 6-7 on page 6-10).

29. Using the wire cutters, cut off all excess material from the wire ties.

30. Perform a functional check of the ZoneAire Sleep Surface System. Refer to the *ZoneAire Sleep Surface System In-Service Manual*.

## Removal

To remove the system, cut all of the red cable ties that were installed during the installation procedure. Perform the installation procedure in reverse order.

## 6.2 Installing on a Non-Retractable Bed Frame

This procedure provides installation and removal instructions for the following bed frames:

- Century series bed: 835, 837
- 425, 426, 715, 720, 723, 820, 822, 8200, 8350

Tools required: Wire cutter
Tape measure
Permanent marker

| | | | |
|---|---|---|---|
| Parts required: | (1) | P1416CA01 | ZoneAire Sleep Surface, 35" x 80", StaphchekComfort mattress ticking |
| | | or | |
| | | P1416CA02 | ZoneAire Sleep Surface, 35" x 80", Ultron ticking |
| | | or | |
| | | P1416EA01 | ZoneAire Sleep Surface, 35" x 80", Staphchek Comfort mattress ticking (flame retardant) |
| | | or | |
| | | P1416EA02 | ZoneAire Sleep Surface, 35" x 80", Ultron ticking (flame retardant) |
| | (1) | 48358 | Caregiver pendant assembly |
| | (1) | 46920s | Power unit assembly |
| | (1) | P72901 | Patient pendant (optional) |
| | (1) | 48811 | Wire tie packet |
| | (2) | 4897002 | Clamping screw (1 1/2") |

6

### Installation

**CAUTION:**
Hill-Rom does not recommend using the bed exit system in conjunction with the ZoneAire Sleep Surface System when the mattress is installed on beds with a spring fabric deck.

1. If the bed is equipped with a DynamicAire Sleep Surface system, make sure its air power switch is in the off position.

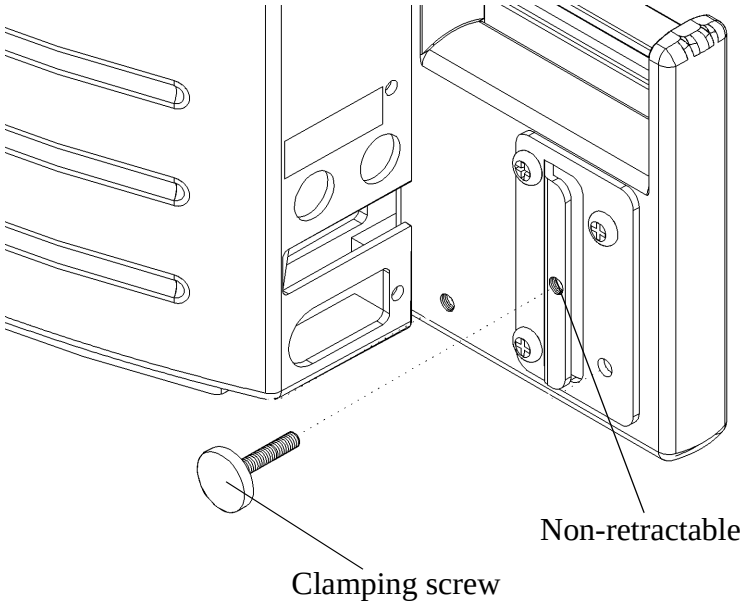
2. Raise the bed to the highest position. Put the head and knee sections in the flat position.

3. Unplug the bed from its power source.

4. Remove the existing mattress and headboard from the bed.

5. Put the power unit on the bed in place of the headboard. Position the clamping screws located on the front of the power unit, in the proper pair of threaded holes (see figure 6-8 on page 6-13).

**Figure 6-8. Clamping Screws**




6. Tighten the appropriate clamping screws to secure the power unit to the headboard posts on the bed frame.

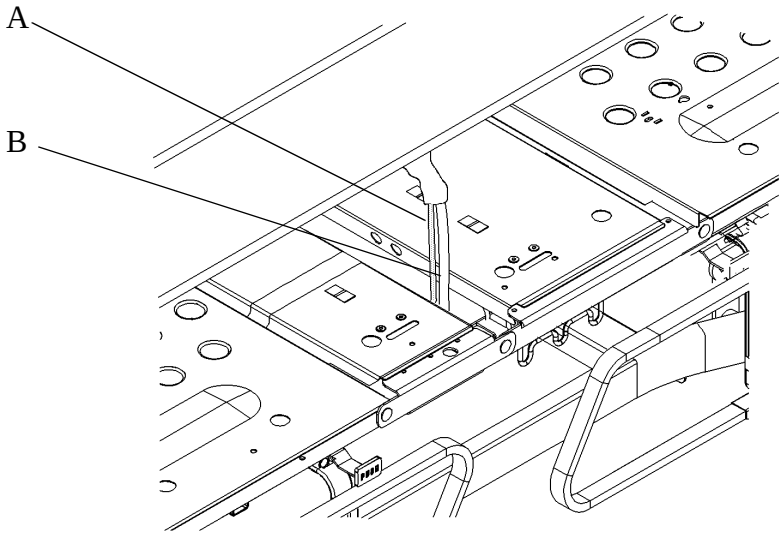
**NOTE:**
Use the clamping screws with the long threads on beds equipped with bayonet mounting posts.

7. Put the ZoneAire Sleep Surface System mattress on the bed with the white heel zone locator buttons at the foot end.

8. **If your bed is equipped with a hard panel sleep surface, complete this step. Otherwise, go to step 9.** Route the mattress power cable (A) and mattress air tube (B) exiting the mattress surface, between the thigh and

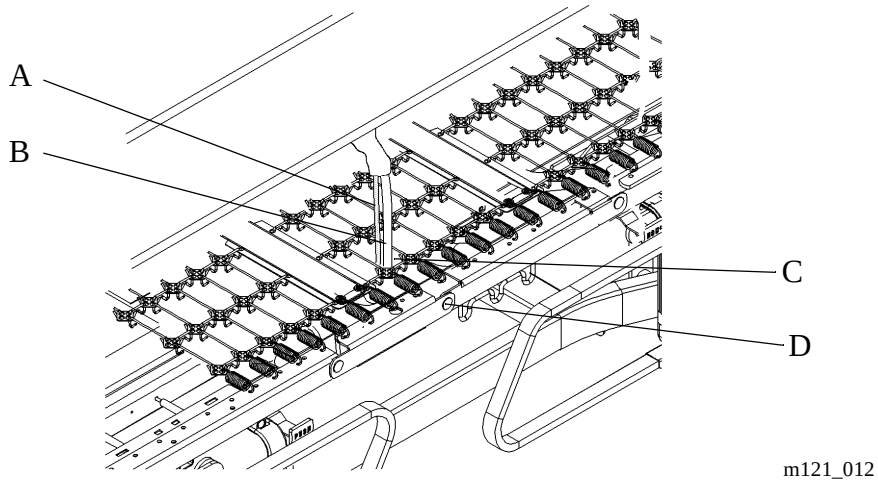
seat sections of the bed (see figure 6-9 on page 6-14). Locate the cable and air hose approximately 8" from the surface edge on the patient's right side.

**Figure 6-9. Bed Equipped With a Hard Panel Sleep Surface**




9. **If your bed is equipped with a spring fabric sleep surface, complete this step. Otherwise, return to step 8.** Route the mattress power cable (A) and mattress air tube (B) exiting the mattress surface, between the thigh and seat sections of the bed and through the first large opening (C) across from the pivot (D) (see figure 6-10 on page 6-14). Locate the power cable and air tube approximately 10" from the surface edge on the patient's right side.

**Figure 6-10. Bed Equipped With a Spring Fabric Sleep Surface**

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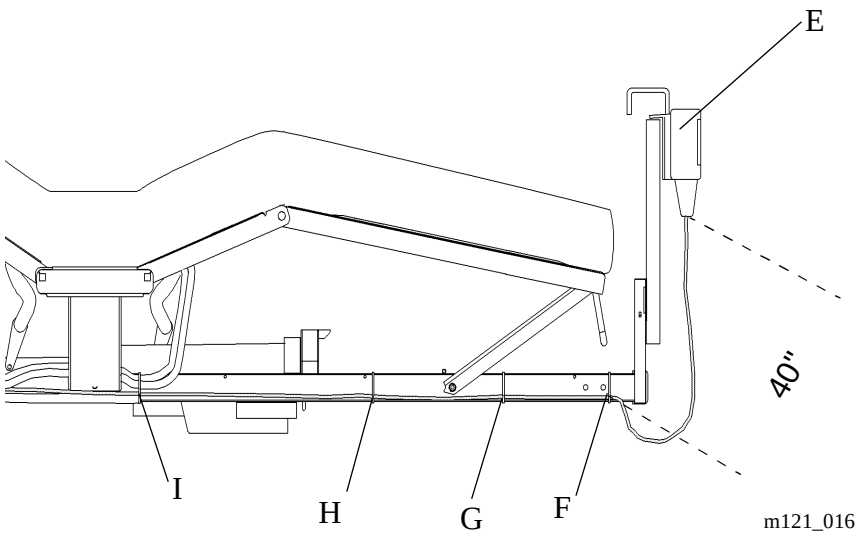
10. Put the caregiver pendant (E) on top of the footboard on the patient's right side (see figure 6-11 on page 6-15).

**Figure 6-11. Caregiver Pendant Cable Routing**




11. **If your bed has head and foot covers, complete this step. Otherwise, go to step 12.** Loosen or remove the six screws that secure the covers to the frame.

12. From the base of the caregiver pendant (E), measure 40" along the pendant cable, and with a permanent marker mark the 40" point.

13. Using a red wire tie, at the 40" mark (F), secure the caregiver pendant cable to the frame at the foot end of the bed on the patient's right side.

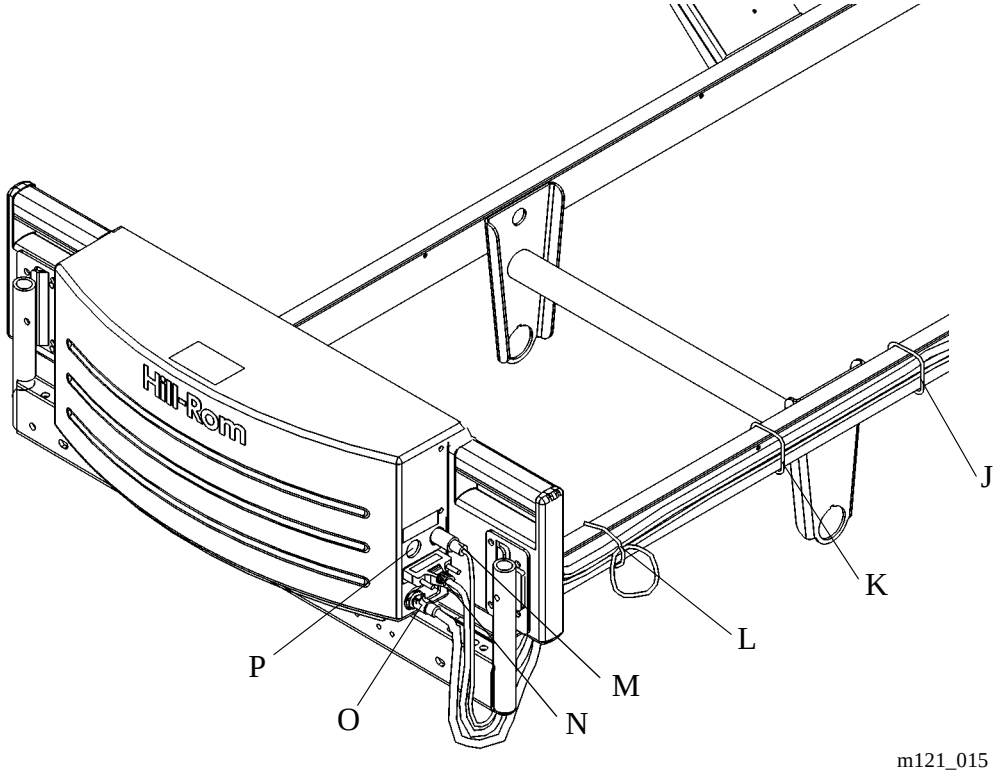
14. Route the caregiver pendant cable along the bed frame rail. Using the red cable ties, secure the caregiver pendant cable to the frame at locations (G) and (H).

**CAUTION:**
The wire ties should be snug enough to hold the cables and the air tube in place but not so snug as to kink or compress the air tube and restrict airflow.

15. Using the red cable ties, secure the caregiver pendant cable, mattress power cable, and mattress air tube to the bed frame at location (I).

16. Using the red cable ties, secure the caregiver pendant cable, mattress power cable, and mattress air tube to the bed frame at locations (J) and (K) (see figure 6-12 on page 6-16).

**Figure 6-12. Cable Routing**




17. Connect the surface air tube (O) to the quick coupling on the power unit assembly.

18. Connect the surface power cable connector (N) to the 25 pin plug on the power unit assembly.

19. Connect the caregiver pendant cable connector (M) to the gray ringed connector on the power unit assembly.

20. Loop the caregiver pendant cable as shown in figure 6-12. Using a red cable tie, secure the caregiver pendant cable, mattress power cable, and mattress air tube to the bed frame at location (L).

21. **If your bed has head and foot covers, complete this step. Otherwise, go to step 22.** After the installation is complete, tighten or install the screws.

22. If a patient pendant is provided, connect it to the black ringed plug (P) on the power unit assembly.

23. Plug the power unit into an appropriate power source.

24. Using the wire cutters, cut off all excess material from the wire ties.

25. Perform a functional check of the ZoneAire Sleep Surface System. Refer to the *ZoneAire Sleep Surface System In-Service Manual*.

## Removal

To remove the system, cut all of the red cable ties that were installed during the installation procedure. Perform the installation procedure in reverse order.

## 6.3 Installing on a Critical Care Bed

This procedure provides installation and removal instructions for the Century CC bed: 892, 894, 895, 896 bed frames.

Tools required:
- Phillips head screwdriver
- Wire cutters
- Tape measure
- Permanent marker
- Hilow safety block

Parts required:

| | | |
|---|---|---|
| (1) | P1414CA01 | ZoneAire Sleep Surface, 32" x 79", Staphchek Comfort mattress ticking |
| | or | |
| | P1414CA02 | ZoneAire Sleep Surface, 32" x 79", Ultron ticking |
| | or | |
| | P1414EA01 | ZoneAire Sleep Surface, 32" x 79", Staphchek Comfort mattress ticking (flame retardant) |
| | or | |
| | P1414EA02 | ZoneAire Sleep Surface, 32" x 79", Ultron ticking (flame retardant) |
| (1) | 48358 | Caregiver pendant assembly |
| (1) | 46920s | Power unit assembly |
| (1) | P72901 | Patient pendant (optional) |
| (1) | 48811 | Wire tie packet |
| (1) | 48755pl | Cable routing bracket |
| (1) | 34606 | Screw (#10) |
| (2) | 4897001 | Clamping screw (1/2") |

### Pre-Installation For Beds With Scale Option Only

**NOTE:**
Refer to the *Century CC Bed In-Service Manual* for bed operating instructions.

1. Raise all four siderails, and put the bed in a full flat position.

2. Raise the bed to a mid height.

3. Using the instructions located at the foot end of the bed, zero the scale.

**CAUTION:**
Do not touch the frame or any part of the bed while zeroing the scale.

4. Press the READ or WEIGHT key, and record the weight.

5. Press the READ or WEIGHT key again, and record the weight.

**NOTE:**
Save the weight readings for the operational check of the scale after the ZoneAire Sleep Surface System installation.

## Installation

**NOTE:**
Refer to the *Century CC Bed In-Service Manual* for bed operating instructions.

1. If the bed is equipped with a DynamicAire Sleep Surface, make sure its air power switch is in the off position.

2. Unplug the bed from its power source.

3. Unbuckle the existing mattress from the frame. If the bed is equipped with a DynamicAire Sleep Surface, disconnect the air tubes.

4. Remove the existing mattress and headboard from the bed.

5. Put the ZoneAire Sleep Surface System mattress on the bed with the white heel zone locator buttons at the foot end.

6. Plug the bed into an appropriate power source.

7. Raise the bed to its highest position, and install the hilow safety block.

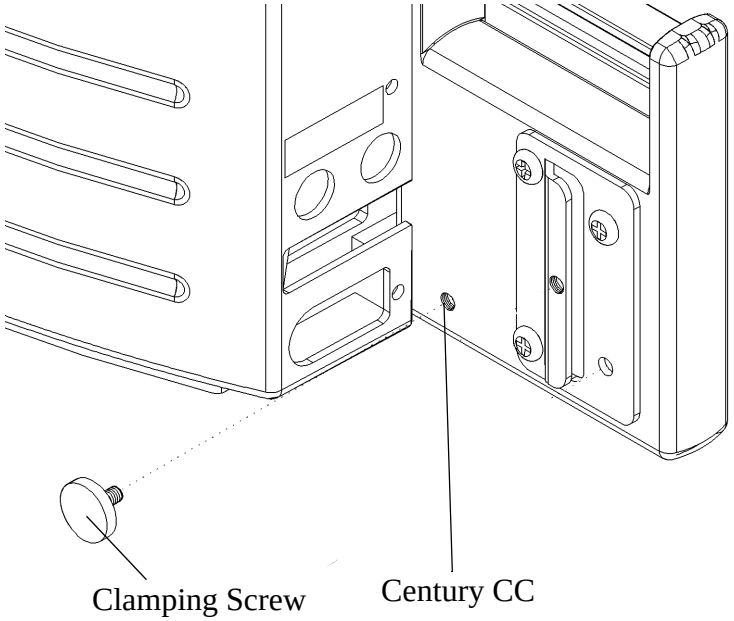
**WARNING:**
To prevent the bed from accidently lowering, install the hilow safety block **after** the bed is raised.

8. Raise the head and knee sections to their highest positions.

9. Unplug the bed from its power source.

10. Put the power unit on the bed in place of the headboard. Position the clamping screws, located on the front of the power unit, in the proper pair of threaded holes (see figure 6-13 on page 6-20).

**Figure 6-13. Clamping Screws**



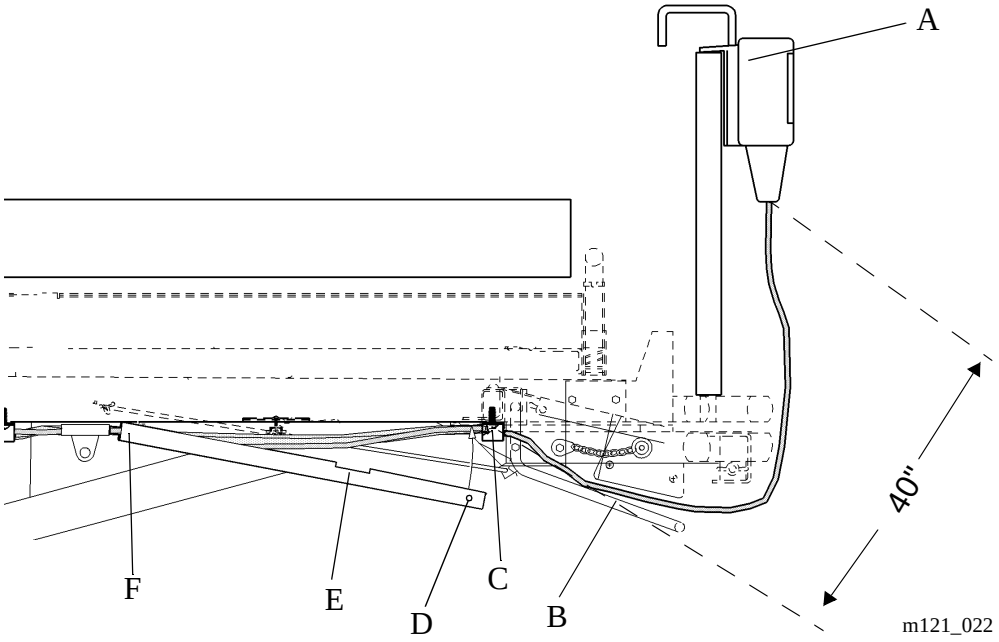

11. Tighten the clamping screws to secure the power unit to the headboard posts on the bed frame.

12. Raise the right foot siderail.

13. Put the caregiver pendant (A) on top of the footboard on the patient's right side (see figure 6-14 on page 6-21).

14. Remove the phillips head screw from the white plastic P-clamp (C) located under the foot section on the patient's right side.

**Figure 6-14. Caregiver Pendant Cable Routing**




15. From the base of the caregiver pendant (A), measure 40" along the pendant cable, and with a permanent marker, mark the 40" point.

16. Route the caregiver pendant cable between the Trendelenburg release handle (B) and the bed frame.

17. Put the caregiver pendant cable into the P-clamp (C) at the 40" mark. Install the phillips head screw to secure the P-clamp (C), the caregiver pendant cable, and the existing cables to the bed frame.

18. Using the phillips head screwdriver, loosen the right side cable cover screw (F) located toward the head end of the bed on the patient's right side.

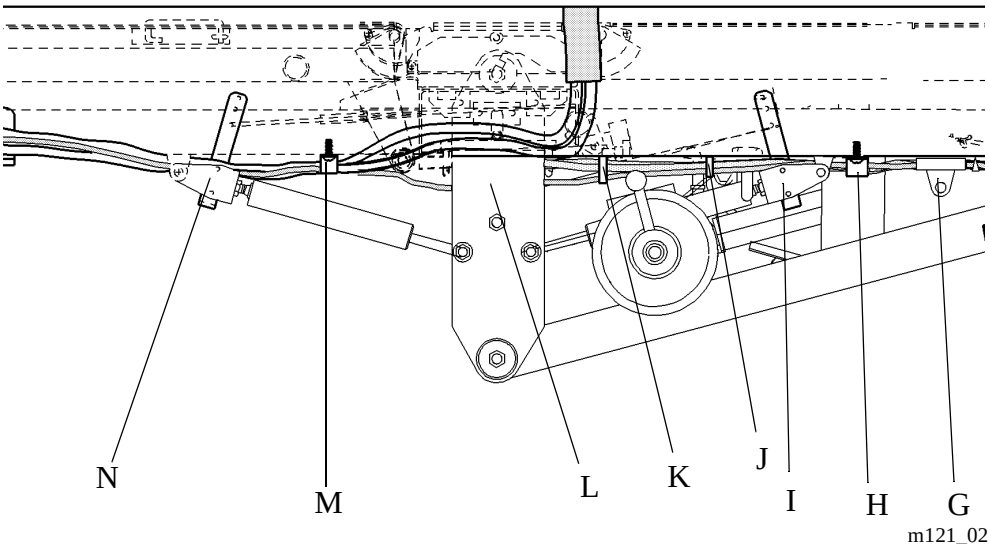
19. Using the phillips head screwdriver, remove the right side cable cover screw (D) located toward the foot end of the bed.

20. Route the caregiver pendant cable into the cable cover (E) along with the existing cable bundle.

21. Using the phillips head screwdriver, install the right side cable cover screw (D), and tighten the screw (F).

22. Continue to route the caregiver pendant cable through the gas spring lever (I), over the pivot (L), and through the gas spring lever (N) (see figure 6-15 on page 6-22).

**Figure 6-15. Cable Routing**




23. Remove the phillips head screw from the white plastic P-clamp (H) located near the foot end gas spring pivot.

24. Route the caregiver pendant cable around the load beam swivel mounting bracket (G).

25. Using a wire tie, secure the caregiver pendant cable to the existing cable bundle directly behind the swivel mounting bracket (G).

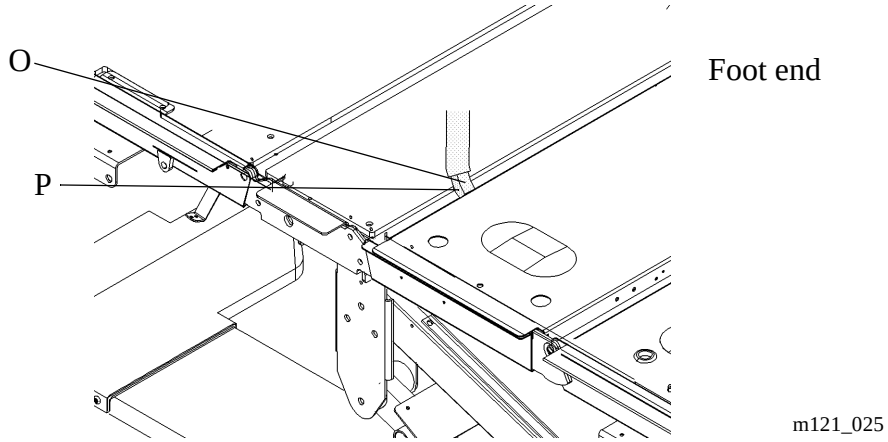
26. Put the caregiver pendant cable into the P-clamp (H) with the existing cables. Using a phillips head screwdriver, install the screw to secure the P-clamp (H), the caregiver pendant cable, and the existing cables to the bed frame.

27. Using the red cable ties, secure the caregiver pendant cable to the existing cable bundle at location (J) and (K).

28. Make sure the mattress hose/cable sleeve is fully below the sleep surface.

29. Route the mattress power cable (O) and mattress air tube (P) exiting the mattress surface between the thigh and seat sections of the bed (see figure 6-16 on page 6-23). Locate the power cable and air hose approximately 10" from the surface edge on the patient's right side.

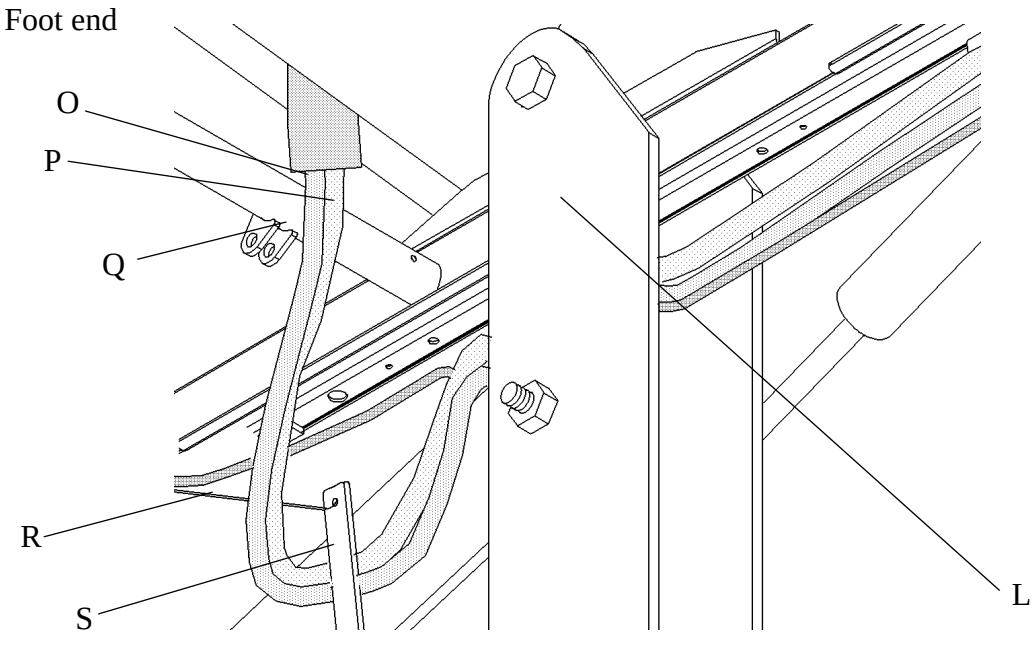
**Figure 6-16. Mattress Cable Routing**




30. Continue to route the mattress cable (O) and air hose (P) under the upper weight frame crossbar (Q) on the head end side, behind the Trendelenburg lever (S), under the cable (R), and over the pivot (L) (see figure 6-17 on page 6-23).

**NOTE:**
The Trendelenburg lever and cable do not exist on new model Century CC beds.

**Figure 6-17. Mattress Cable Routing**

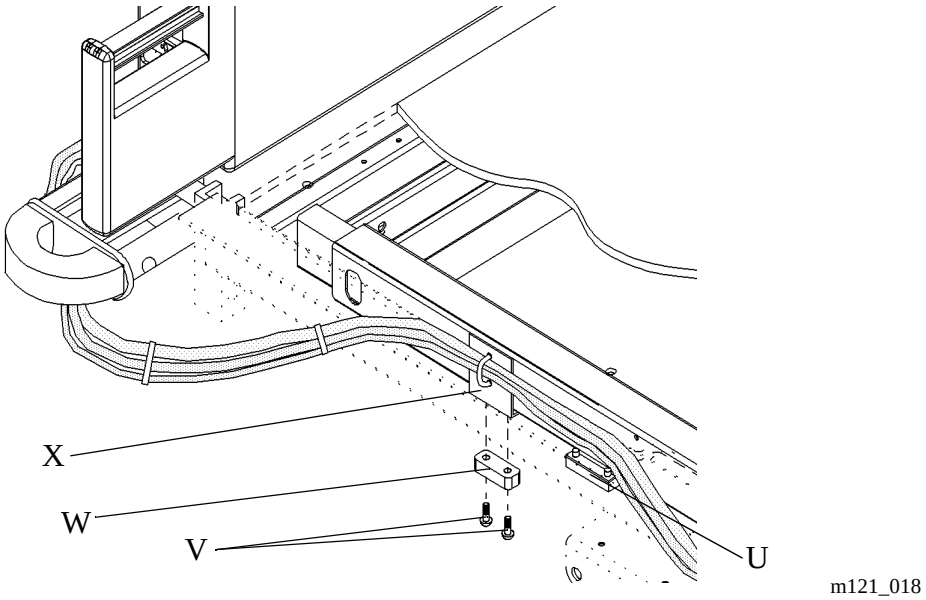



6

31. Route the surface power cable and the air tube through the head end gas spring lever (N) along with the caregiver pendant cable (see figure 6-15 on page 6-22).

32. Remove the two screws (V) that secure the right side hard rubber stop (W) to the bed frame (see figure 6-18 on page 6-24).

**Figure 6-18. Bracket Installation**




33. Put a red wire tie through the holes in the bracket (X).

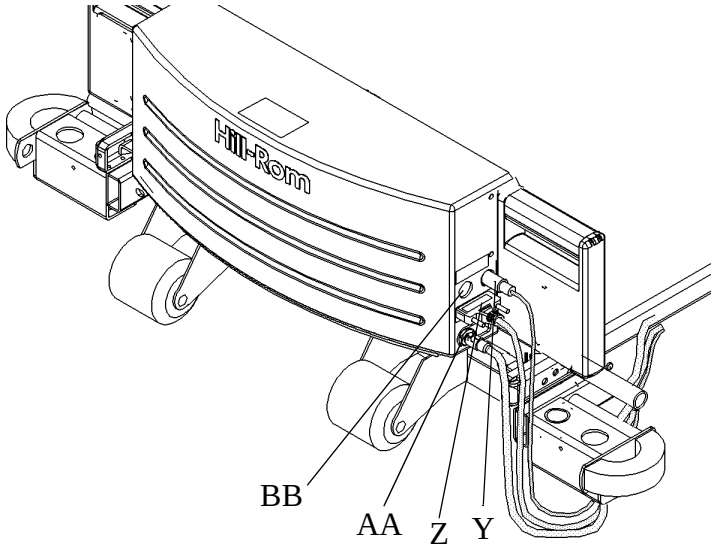
34. Install the two screws (V) to secure the bracket provided (X) and the hard rubber stop (W) to the bed frame.

35. While holding the mattress power cable, mattress air hose, and caregiver pendant cable connectors flush with each other, measure 26" from the connector ends. Secure the cables and hose bundle to the bracket (X) at the 26" point with a red cable tie.

36. Route the caregiver pendant cable, the mattress power cable, and the mattress air hose around the load beam swivel mounting bracket (U).

37. Connect the surface air tube (AA) to the quick coupling on the power unit assembly (see figure 6-19 on page 6-25).

**Figure 6-19. Cable Connection**



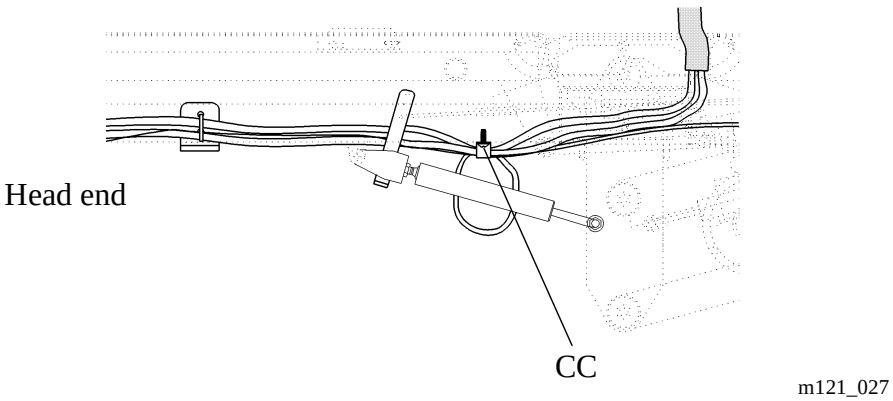

38. Connect the surface power cable connector (Z) to the 25 pin plug on the power unit assembly.

39. Connect the caregiver pendant cable connector (Y) to the gray ringed connector on the power unit assembly.

40. Pull all slack in the mattress power cable and air hose back toward the seat section.

41. Locate the hole (CC) in the intermediate frame on the right side just above the head end gas spring. Take up any slack in the caregiver pendant cable, and loop the excess directly under the hole (see figure 6-20 on page 6-25).

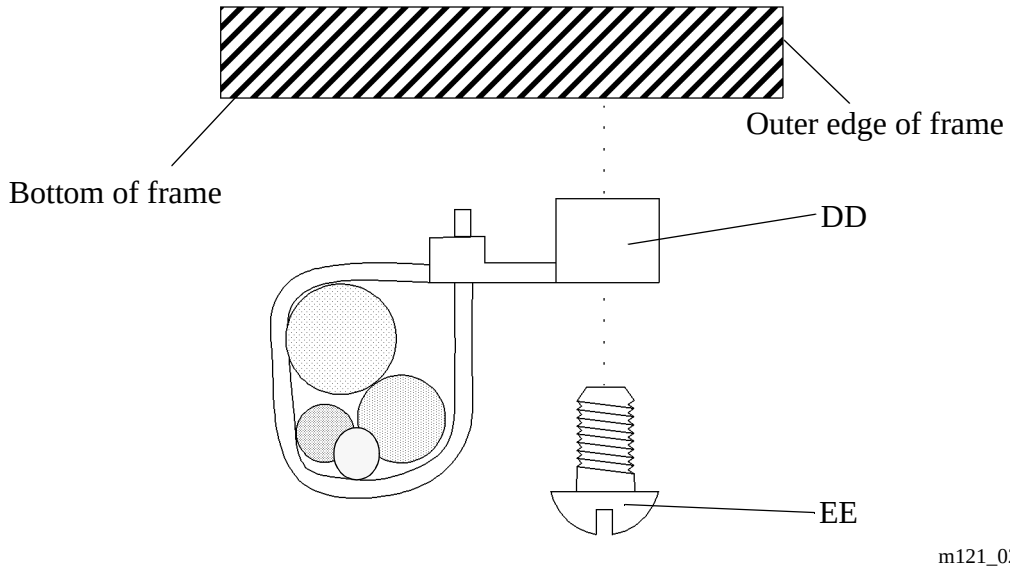
**Figure 6-20. Hole in Intermediate Frame**



42. Using the wire tie that has the mounting hole, tie wrap the looped caregiver pendant cable, mattress power cable, and mattress air hose together. Position the wire tie so that it is directly under the hole (CC) (see figure 6-20 on page 6-25) in the intermediate frame, and the wire tie loop is pointing down and away from the upper weigh frame (see figure 6-21 on page 6-26).

**CAUTION:**
The wire ties should be snug enough to hold the cables and the air tube in place but not so snug as to kink or compress the air tube and restrict airflow.

**Figure 6-21. Wire Tie With Mounting Hole Orientation**




43. Cut off the excess wire tie material from the wire tie with the mounting hole.

44. Using the #10 screw (EE) provided, secure the wire tie (DD) to the intermediate frame.

45. If a patient pendant is provided, connect it to the black ringed plug (BB) on the power unit assembly (see figure 6-19 on page 6-25).

46. Cut off all excess wire tie material.

47. Perform a functional check of the ZoneAire Sleep Surface System. Refer to the *ZoneAire Sleep Surface System In-Service Manual*.

## Post Installation For Beds With Scale Option Only

**NOTE:**
Refer to the *Century CC Bed In-Service Manual* for bed operating instructions.

1. Plug the bed into an appropriate power source.
2. Raise all four siderails, and put the bed in a full flat position.
3. Raise the bed to a mid height.
4. Shake the upper frame and inspect the ZoneAire Sleep Surface System cable routing to make sure it does not interfere with the scale system.

**CAUTION:**
Do not touch the frame or any part of the bed while zeroing the scale.

5. Using the instructions located at the foot end of the bed, zero the scale.
6. Press the READ or WEIGHT key, and record the weight.
7. Press the READ or WEIGHT key again, and record the weight.
8. Compare these weight readings with the weight readings taken during the pre-installation instructions at the beginning of this procedure. If the scale readings are not the same, inspect the ZoneAire Sleep Surface System cable routing for interference with the scale system.
9. Plug the power unit into an appropriate power source.
10. Perform a functional check of the ZoneAire Sleep Surface System. Refer to the *ZoneAire Sleep Surface System In-Service Manual*.

## Removal

To remove the system, cut all of the red cable ties that were installed during the installation procedure. Perform the installation procedure in reverse order.

## Cleaning and Care

**WARNING:**
Unplug the unit from its power source before servicing or cleaning the unit. Refer to the *ZoneAire Sleep Surface* System *In-Service Manual* and specific sections in this manual for additional precautions.

### General Cleaning

Clean the unit with a lightly dampened cloth and ordinary disinfectants. Do not subject any area to excessive amounts of liquid.

### Steam Cleaning

Do not use any steam cleaning device on the ZoneAire Sleep Surface System. The excessive moisture involved can damage mechanisms and components in the unit.

### Hard to Clean Spots

Use standard household cleaners and/or a soft bristle brush to remove troublesome spots or stains. Heavy dried-on soil and excreta may first require soaking to loosen.

**CAUTION:**
Do not use harsh cleaners, solvents, or detergents.

### Disinfection

Dilute disinfectants and/or germicides as specified on the manufacturer's label.

## Lubrication Requirements

The ZoneAire Sleep Surface System has no periodic lubrication requirements.

## Preventive Maintenance

The ZoneAire Sleep Surface System must have an effective maintenance program. We recommend that you perform preventive maintenance and testing for Joint Commission on Accreditation of Healthcare Organizations (JCAHO) annually. This not only meets JCAHO requirements, but will help to ensure a long and productive life for the ZoneAire Sleep Surface System. This will help minimize downtime due to excessive wear failures.

The preventive maintenance schedule that follows is intended to guide the technician through a normal preventive maintenance procedure on the ZoneAire Sleep Surface System. Check each item on the schedule, and make any necessary adjustments during the preventive maintenance process.

The preventive maintenance schedule is intended to be used in conjunction with the preventive maintenance checklist following it. This checklist is designed to keep a running history of maintenance and subsequent repair costs for one individual ZoneAire Sleep Surface System. However, the facility can modify this checklist or invent another to fit its needs. Keeping close records and maintaining the ZoneAire Sleep Surface System and its accessories are two good ways of reducing downtime and at the same time, keeping the nursing staff happy and efficient.

## Preventive Maintenance Schedule

**Table 6-1. Preventive Maintenance Schedule**

| Function | Procedure |
|---|---|
| Power unit assembly | Check the mattress power cable for cuts, nicks, or breaks.<br>Check all hose connections to the mattress for punctures, cuts, or tears<br>Check the o-rings on hose connections for dried out condition. |
| Air compressor | Inspect the compressor unit air hoses for punctures, cuts, or tears. |
| Power cord | Inspect the power cord and plug for cuts, nicks, or breaks. |
| Caregiver pendant | Check the general aesthetics of the unit.<br>Inspect the labels, and replace as necessary.<br>Check the cable for cuts, nicks, or breaks. |
| Patient pendant | Check the general aesthetics of the unit.<br>Inspect the labels, and replace as necessary.<br>Check the cable for cuts, nicks, or breaks. |
| Sleep surface | Check the mattress and air bladders for punctures, cuts, or tears.<br>Check all hose connections to the mattress and o-rings for dried out condition. |
| Cable routing | • For retractable beds: Advance series bed, 840 and 850 series bed, and Centra beds, refer to procedure 6.1.<br>• For non-retractable beds: Century series and 425, 426, 715, 720, 723, 820, 822, 8200, 8350 beds, refer to procedure 6.2.<br>• For Century CC bed: 892, 894, 895, 896 bed frames, refer to procedure 6.3. |
| Functional check | See “Function Checks” on page 2-4. |
| Overall appearance | Check the general aesthetics of the unit.<br>Touch up the paint where necessary. |

## Preventive Maintenance Checklist

**Table 6-2. Preventive Maintenance Checklist**

| **Date** | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | **Function** |
| Hill-Rom Company Inc. | **Manufacturer** | | | | | | | | | | | | | | | | | | | | | Power unit assembly |
| | | | | | | | | | | | | | | | | | | | | | | Air compressor |
| | | | | | | | | | | | | | | | | | | | | | | Power cord |
| | | | | | | | | | | | | | | | | | | | | | | Caregiver pendant |
| | | | | | | | | | | | | | | | | | | | | | | Patient pendant |
| | | | | | | | | | | | | | | | | | | | | | | Sleep surface |
| | | | | | | | | | | | | | | | | | | | | | | Cable routing |
| | | | | | | | | | | | | | | | | | | | | | | Function check |
| | **Model Number** | | | | | | | | | | | | | | | | | | | | | Overall appearance |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
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| | **Serial Number** | | | | | | | | | | | | | | | | | | | | | |
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| | **Total Cost for This Page** | | | | | | | | | | | | | | | | | | | | | Labor Time: |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | Repair Cost: |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | Inspected By: |
| | | | | | | | | | | | | | | | | | | | | | | **Legend**<br>L=Lube<br>C=Clean<br>A=Adjust<br>R=Repair or Replace<br>O=Okay<br>N=Not Applicable<br>Remarks: |

## Tool and Supply Requirements

The ZoneAire Sleep Surface System requires no special tools or supplies.

# Chapter 7
# Accessories

## Chapter Contents


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Trapeze Support Adapter Kit . . . . . 7 - 4

Installation . . . . . 7 - 5

**NOTES:**

# Accessories

**Table 7-1. Accessories List**

| Product Number | Description |
|---|---|
| P844A02 | Trapeze support adapter kit |

## 7.1 Trapeze Support Adapter Kit

The trapeze support adapter kit must be used any time the trapeze support is used in conjunction with the ZoneAire Sleep Surface System. The trapeze support adapter kit provides the additional space necessary to attach the ZoneAire Sleep Surface System power unit assembly at the head end of the bed.

This procedure provides installation and removal instructions for the following bed frames:

- Advance series bed (3 motor): 1100, 1110, 1120, 1130, 1140
- Advance series bed (4 motor): 1105, 1115, 1135, 1145
- Centra series bed (3 motor): 850, 852
- Centra series bed (4 motor): 1060, 1061, 1062, 1063, 1064

Tools required: 3/8" nut driver 3/8" open end wrench

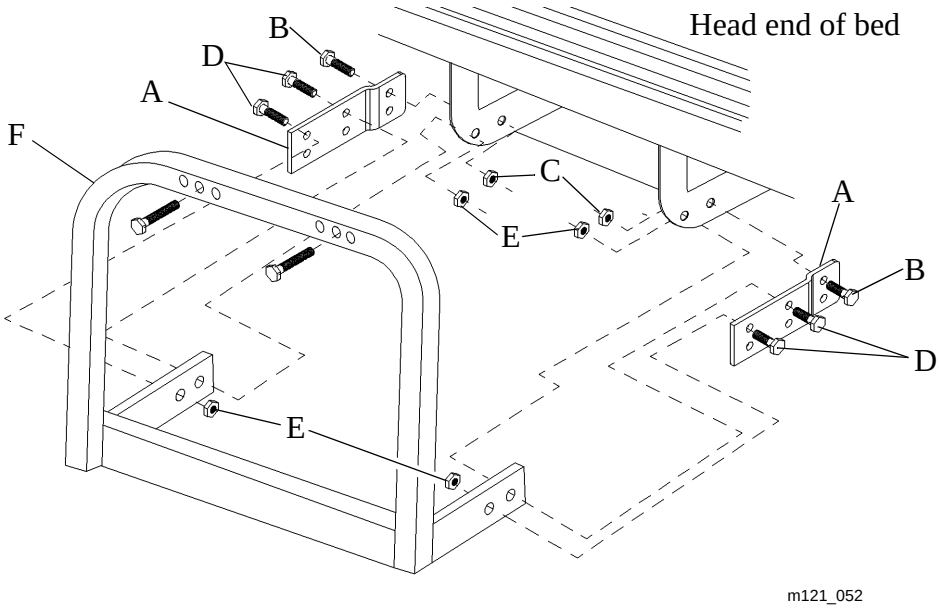
Parts required:

| | | |
|---|---|---|
| (1) | P844A02 | Trapeze Support Adapter |

P844A02, Trapeze Support Adapter, includes the following parts:

| | | |
|---|---|---|
| (2) | 48948 | Trapeze adapter bracket |
| (6) | 90017-20 | Screw |
| (6) | 90132-21 | Hex nut |
| (1) | 311614 | Bag |
| (1) | 48972 | Installation instructions |

**Figure 7-1. Trapeze Support Adapter Kit**




## Installation

1. Loosely attach both trapeze adapter brackets (A) to the bed frame with hex bolts (B) and hex nuts (C) (see figure 7-1 on page 7-5).

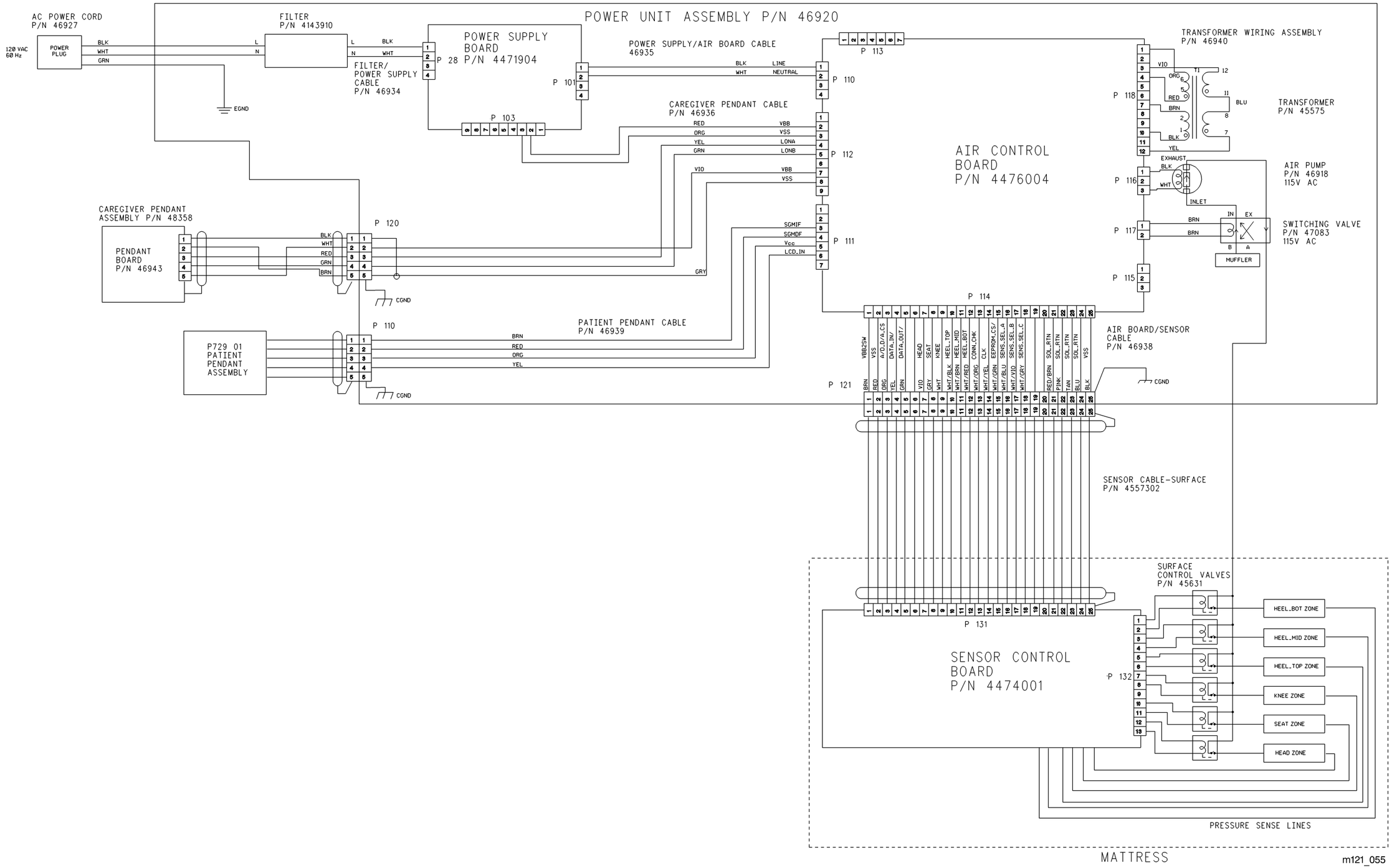
2. Align the trapeze bracket (F), and loosely secure with the hex bolts (D) and hex nuts (E), (see figure 7-1 on page 7-5).

3. Tighten all hex nuts.

**NOTES:**

# Schematic Wiring Diagram—ZoneAire Sleep Surface System

Back to Chapter 3




m121_055

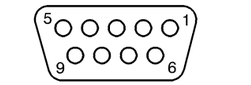
FO 3-1

# Power Unit Block Diagram

Back to Chapter 2

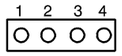
Back to Chapter 3

P 103
P 112




| | |
|---|---|
| 1 | 6 |
| 2 VBB (RED) | 7 VBB (VIO) |
| 3 VSS (ORG) | 8 VSS (GRY) |
| 4 LON A (YEL) | 9 |
| 5 LON B (GRN) | |

P 110




| |
|---|
| 1 LINE (BLK) |
| 2 NEUTRAL (WHT) |
| 3 |
| 4 |

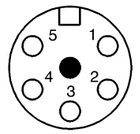
P 116

| |
|---|
| 1 LINE (BLK) |
| 2 |
| 3 NEUTRAL (WHT) |

P 117

| |
|---|
| 1 (BRN) |
| 2 (BRN) |

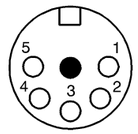
P 119




| |
|---|
| 1 SGMIF (BRN) |
| 2 SGMDF (RED) |
| 3 VCC (ORG) |
| 4 LCD in (YEL) |
| 5 CGND |

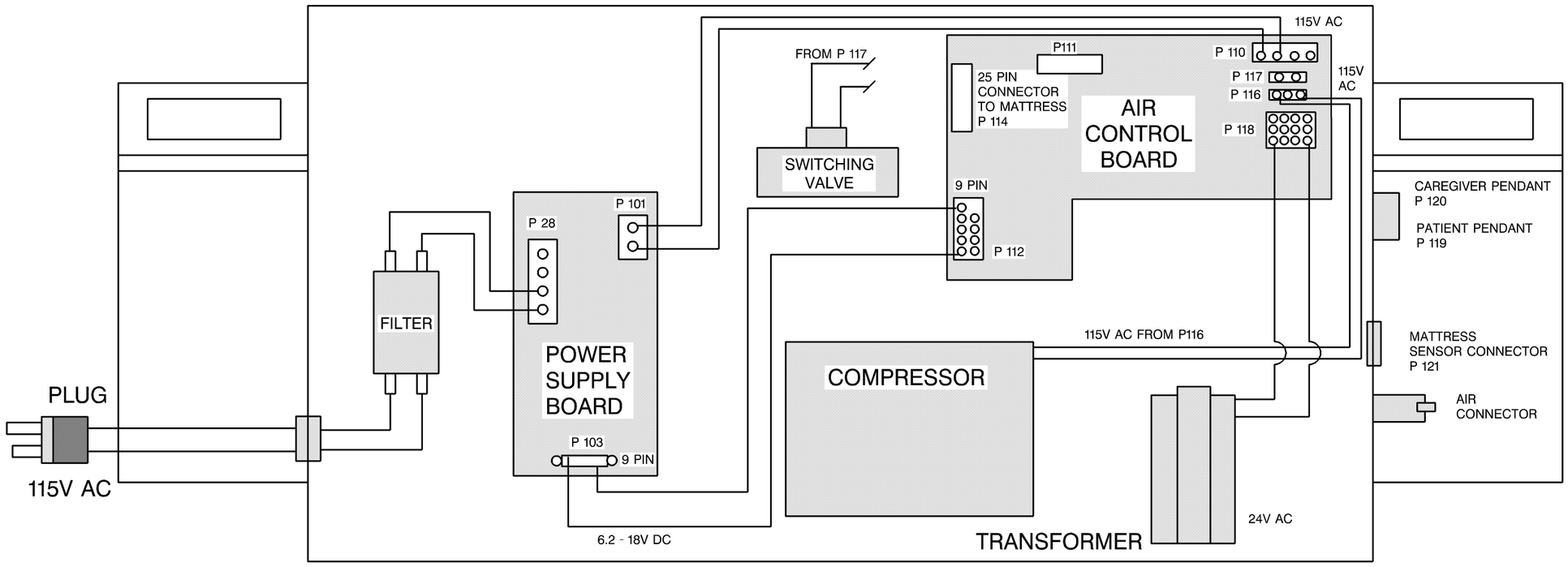
PATIENT PENDANT

P 120




| |
|---|
| 1 Vss (GRY) |
| 2 Vbb (VIO) |
| 3 LON A (YEL) |
| 4 LON B (GRN) |
| 5 Vss (GRY) |

CAREGIVER PENDANT

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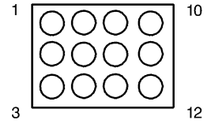


| | |
|---|---|
| 1 (ORG) | 7 (BRN) |
| 2 (N/C) | 8 (N/C) |
| 3 (VIO) | 9 (N/C) |
| 4 (RED) | 10 (BLK) |
| 5 (N/C) | 11 (N/C) |
| 6 (N/C) | 12 (YEL) |

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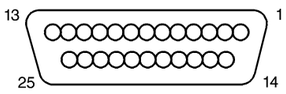
P 121




| | | |
|---|---|---|
| 1 VBB2SW (BRN) | 10 HEEL_TOP (WHT/BLK) | 18 SENS_SEL_C (WHT/GRY) |
| 2 Vss (RED) | 11 HEEL_MID (WHT/BRN) | 19 |
| 3 A/O_O/A_CS (ORG) | 12 HEEL_BOT (WHT/RED) | 20 |
| 4 DATA_IN/ (YEL) | 13 CONN_CHK (WHT/ORG) | 21 SOL_RTN (RED/BRN) |
| 5 DATA_OUT (GRN) | 14 CLK (WHT/YEL) | 22 SOL_RTN (PINK) |
| 6 | 15 EEPROM_CS/ (WHT/GRN) | 23 SOL_RTN (TAN) |
| 7 HEAD (VIO) | 16 SENS_SEL_A (WHT/BLU) | 24 SOL_RTN (BLU) |
| 8 SEAT (GRY) | 17 SENS_SEL_B (WHT/VIO) | 25 Vss (BLK) |
| 9 KNEE (WHT) | | |

m121_056

# Schematic Wiring Diagram—Caregiver Pendant

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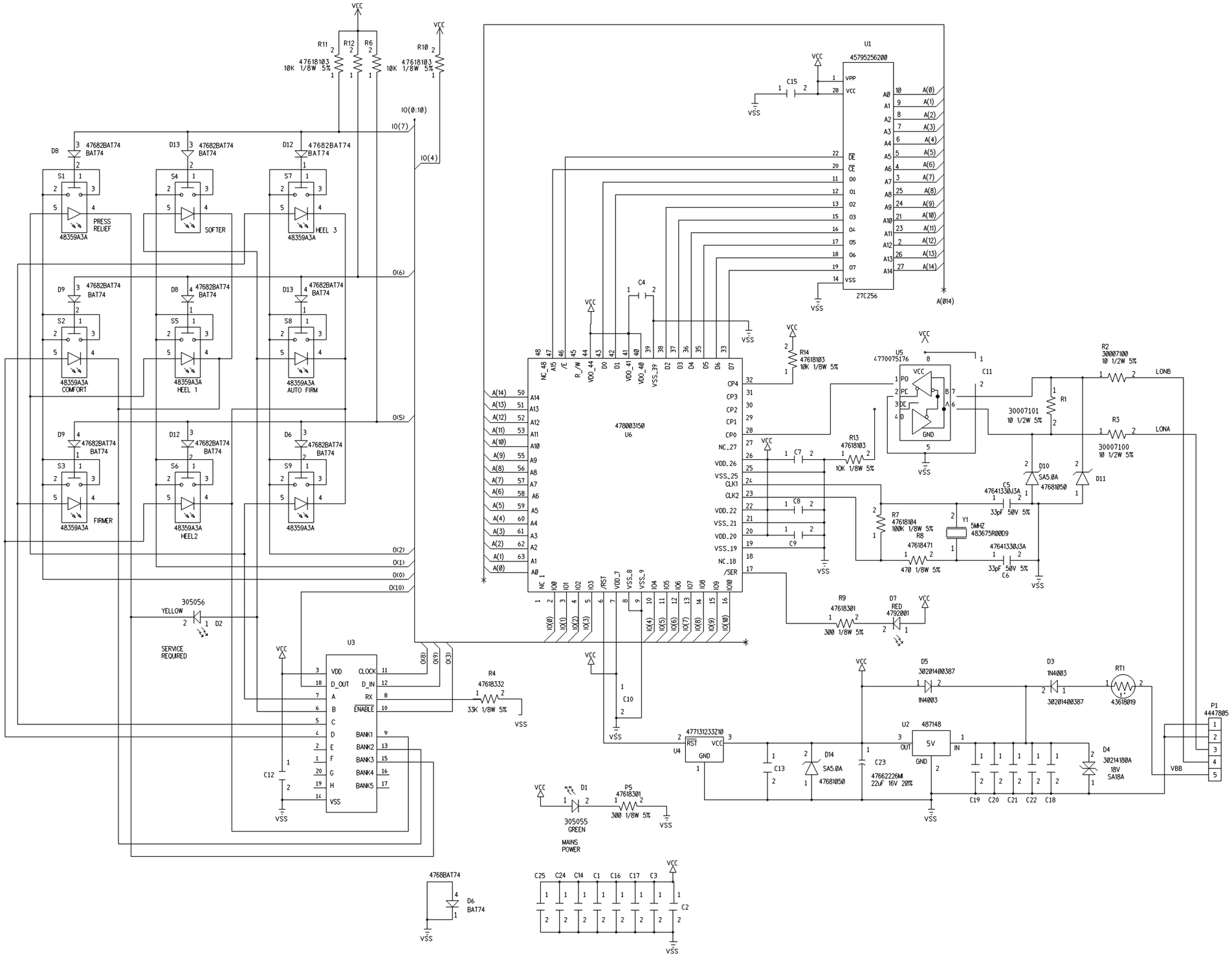


m121_041

# Schematic Wiring Diagram—Power Supply

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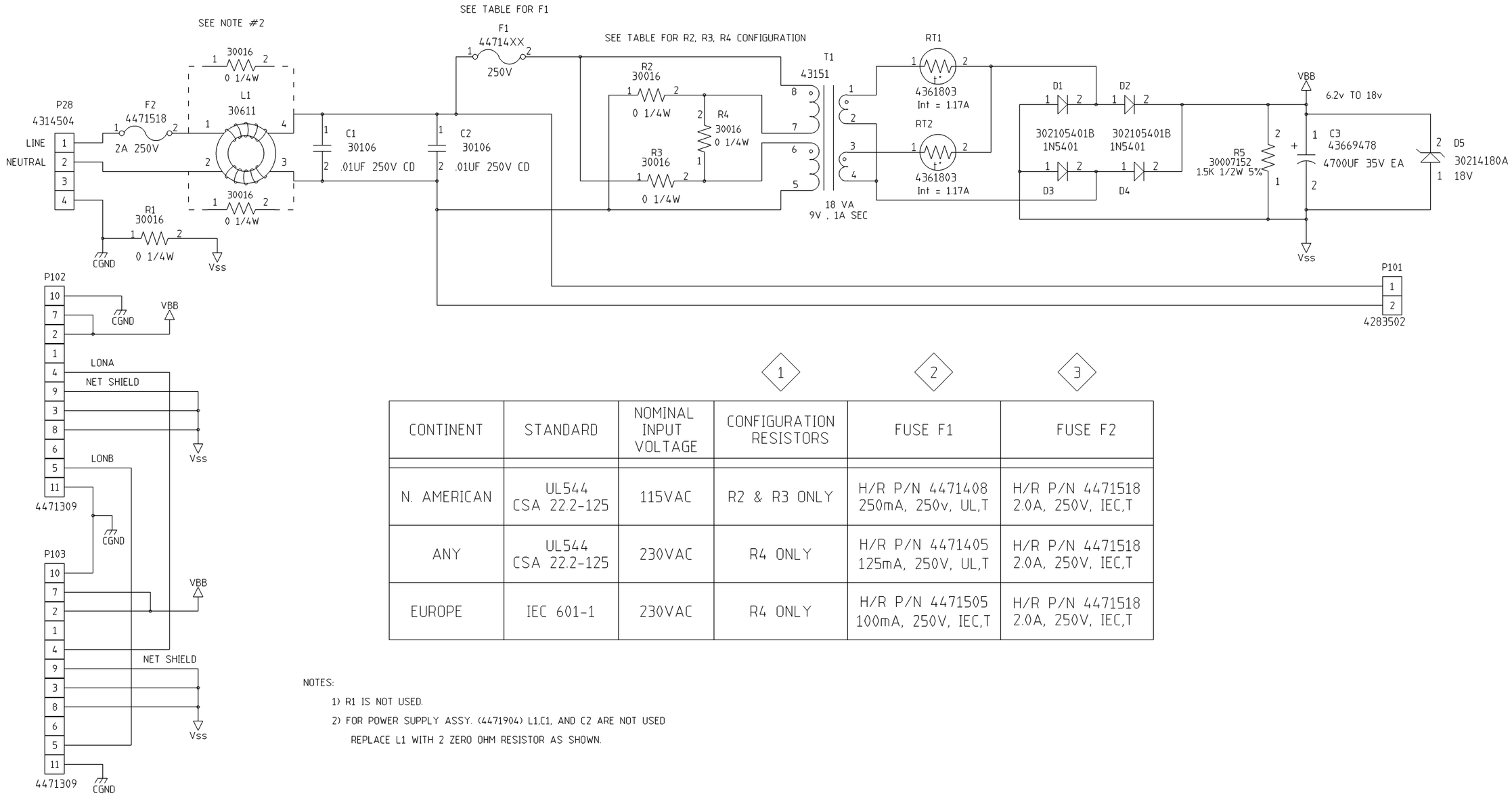


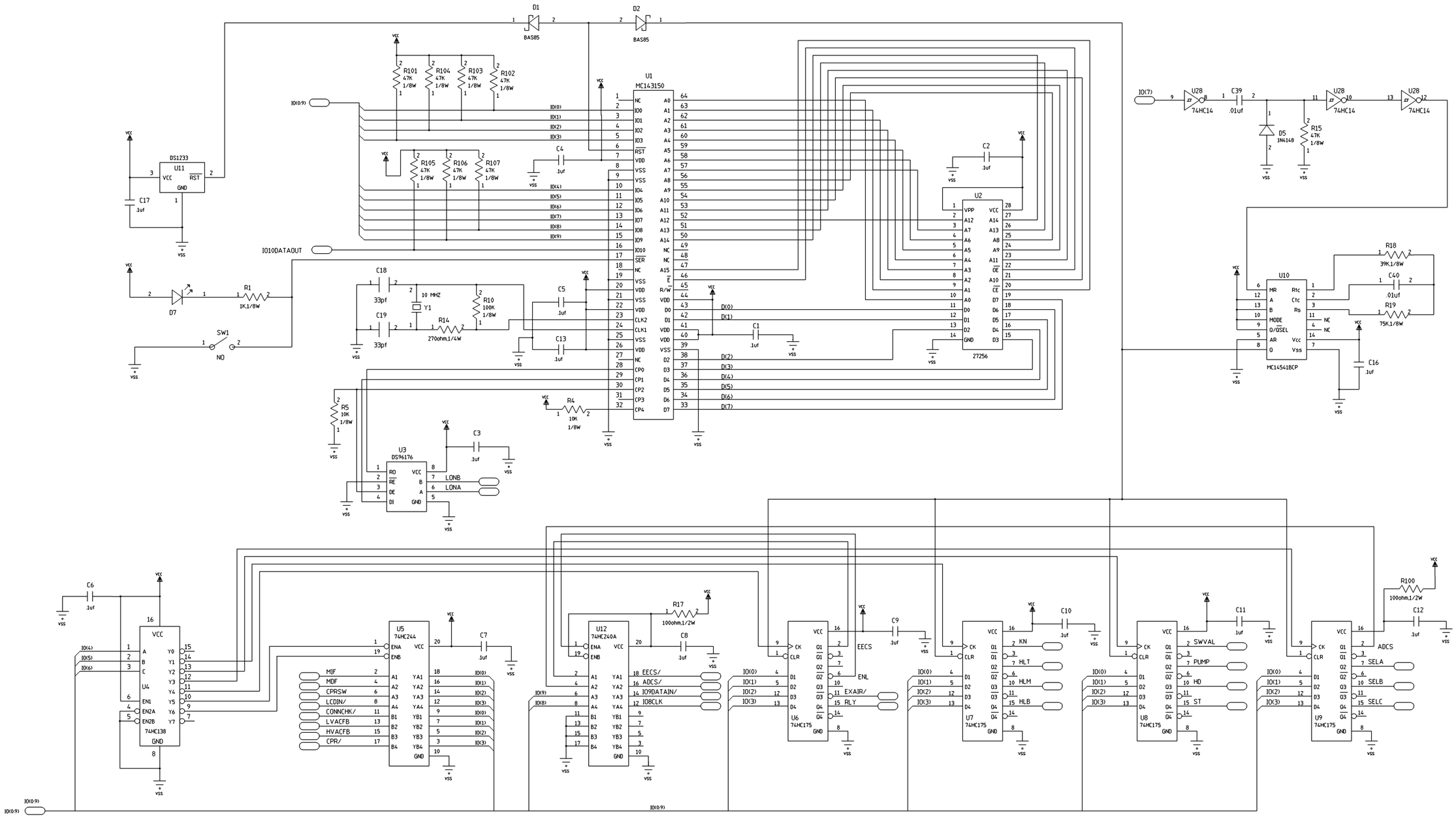

| CONTINENT | STANDARD | NOMINAL INPUT VOLTAGE | CONFIGURATION RESISTORS ◇1 | FUSE F1 ◇2 | FUSE F2 ◇3 |
|---|---|---|---|---|---|
| N. AMERICAN | UL544<br>CSA 22.2-125 | 115VAC | R2 & R3 ONLY | H/R P/N 4471408<br>250mA, 250v, UL,T | H/R P/N 4471518<br>2.0A, 250V, IEC,T |
| ANY | UL544<br>CSA 22.2-125 | 230VAC | R4 ONLY | H/R P/N 4471405<br>125mA, 250V, UL,T | H/R P/N 4471518<br>2.0A, 250V, IEC,T |
| EUROPE | IEC 601-1 | 230VAC | R4 ONLY | H/R P/N 4471505<br>100mA, 250V, IEC,T | H/R P/N 4471518<br>2.0A, 250V, IEC,T |

NOTES:

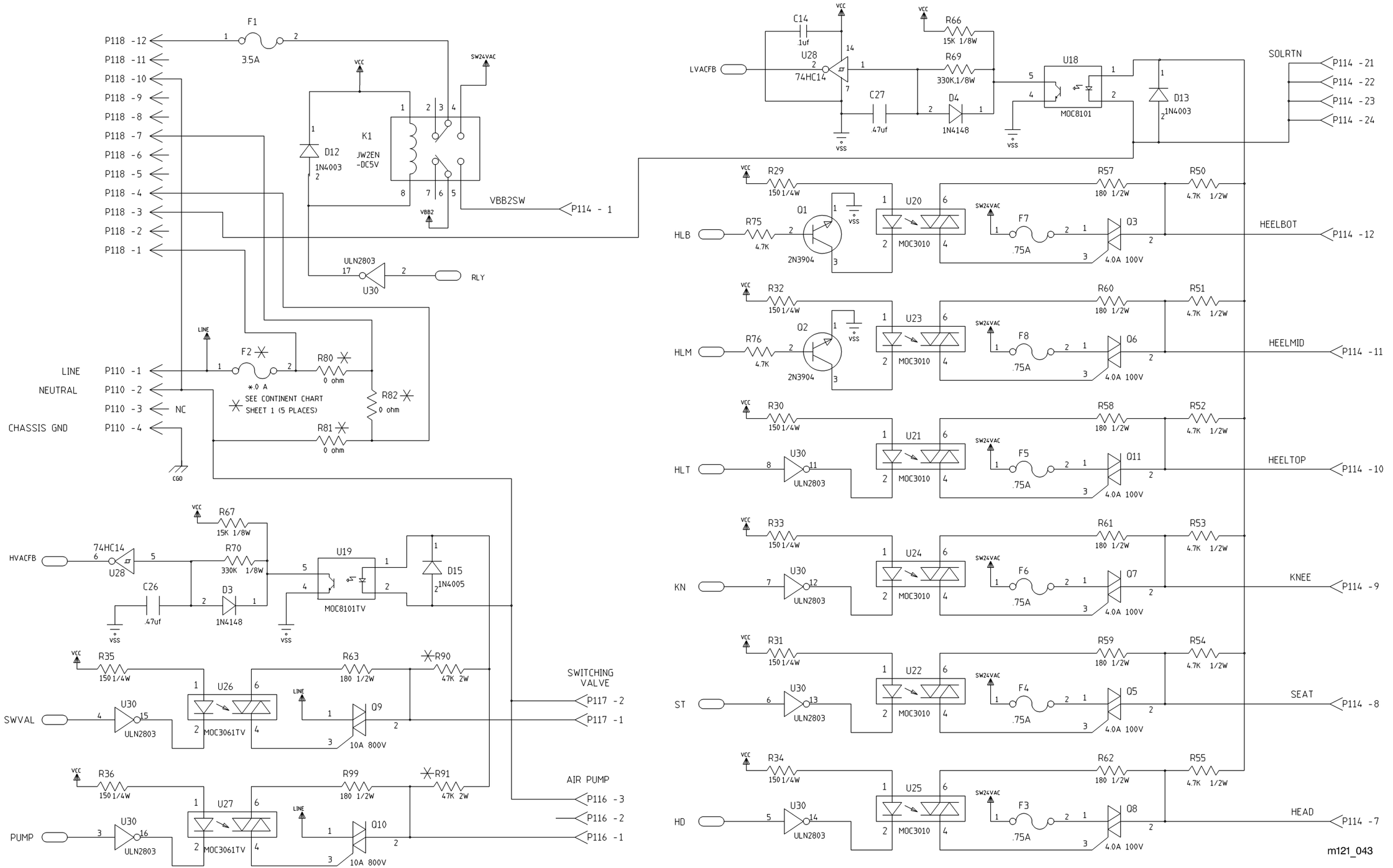
1) R1 IS NOT USED.

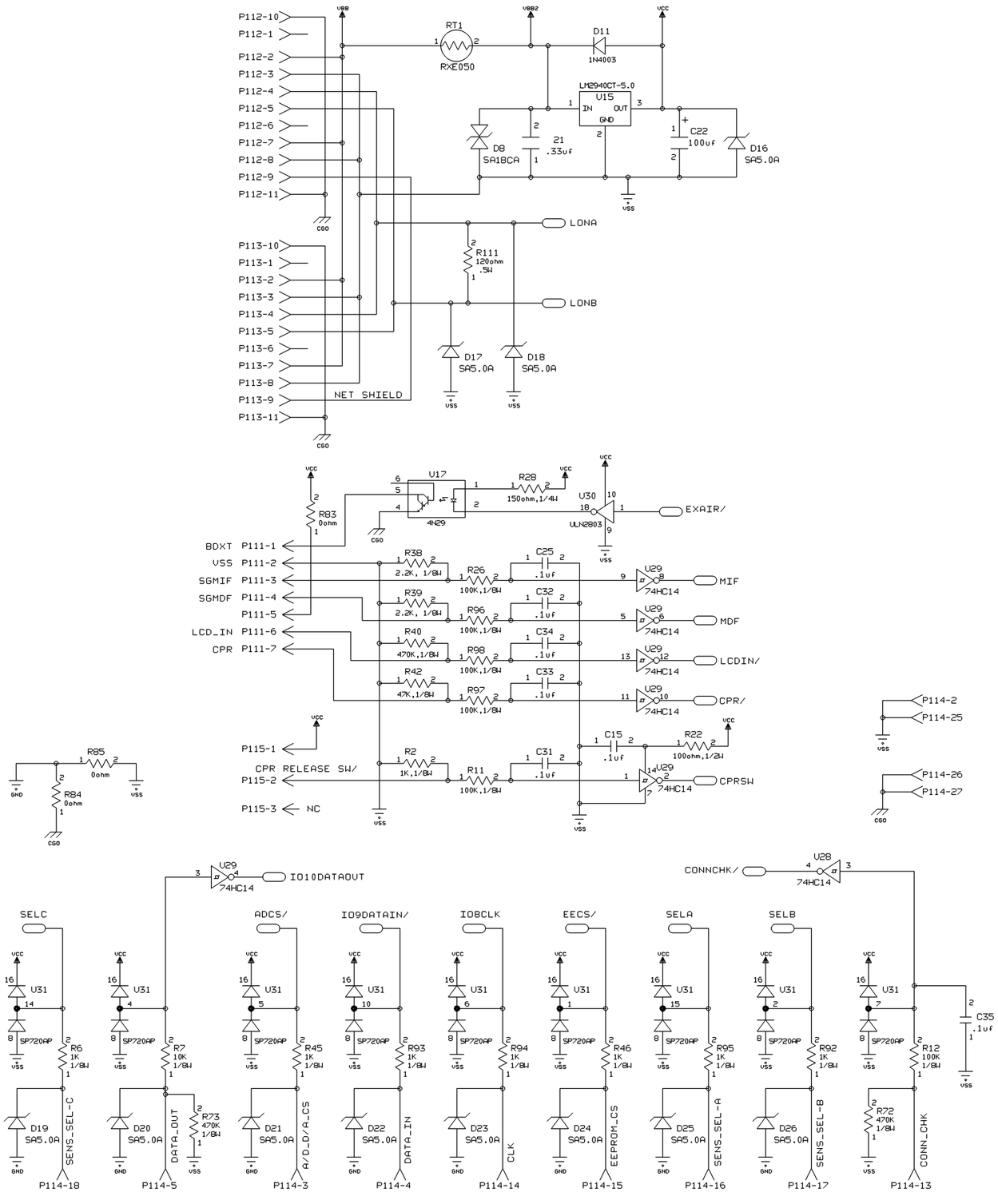
2) FOR POWER SUPPLY ASSY. (4471904) L1,C1, AND C2 ARE NOT USED
REPLACE L1 WITH 2 ZERO OHM RESISTOR AS SHOWN.

m121_038


D1
BAS85
D2
BAS85
U1
MC143150
IO(0:9)
IO10DATAOUT
R101 47K 1/8W
R104 47K 1/8W
R103 47K 1/8W
R102 47K 1/8W
R105 47K 1/8W
R106 47K 1/8W
R107 47K 1/8W
C4 .1uf
C2 .1uf
U2
27256
DS1233
U11
C17 .1uf
D7
R1 1K,1/8W
SW1
NO
C18 33pf
C19 33pf
10 MHZ
Y1
R14 270ohm,1/4W
R10 100K 1/8W
C5 .1uf
C13 .1uf
C1 .1uf
R4 10K 1/8W
R5 10K 1/8W
U3
DS96176
C3 .1uf
LONB
LONA
D(0)
D(1)
D(2)
D(3)
D(4)
D(5)
D(6)
D(7)
U28
74HC14
C39 .01uf
D5 1N4148
R15 47K 1/8W
U10
MC14541BCP
R18 39K,1/8W
C40 .01uf
R19 75K,1/8W
C16 .1uf
C6 .1uf
U4
74HC138
U5
74HC244
MIF
MDF
CPRSW
LCDIN/
CONNCHK/
LVACFB
HVACFB
CPR/
C7 .1uf
U12
74HC240A
R17 100ohm,1/2W
C8 .1uf
EECS/
ADCS/
IO9DATAIN/
IO8CLK
U6
74HC175
EECS
ENL
EXAIR/
RLY
C9 .1uf
U7
74HC175
KN
HLT
HLM
HLB
C10 .1uf
U8
74HC175
SWVAL
PUMP
HD
ST
C11 .1uf
U9
74HC175
ADCS
SELA
SELB
SELC
R100 100ohm,1/2W
C12 .1uf
vcc
vss

m121_042


P118 -12
P118 -11
P118 -10
P118 -9
P118 -8
P118 -7
P118 -6
P118 -5
P118 -4
P118 -3
P118 -2
P118 -1
F1
3.5A
VCC
SW24VAC
K1
JW2EN
-DC5V
D12
1N4003
VBB2
VBB2SW
P114 - 1
ULN2803
U30
RLY
LINE
NEUTRAL
CHASSIS GND
P110 -1
P110 -2
P110 -3
P110 -4
NC
F2
*0 A
SEE CONTINENT CHART
SHEET 1 (5 PLACES)
R80
0 ohm
R81
R82
CGO
R67
15K 1/8W
HVACFB
74HC14
U28
R70
330K 1/8W
U19
MOC8101TV
D15
1N4005
C26
.47uf
D3
1N4148
VSS
R35
150 1/4W
R63
180 1/2W
R90
47K 2W
U26
SWVAL
ULN2803
MOC3061TV
Q9
10A 800V
SWITCHING VALVE
P117 -2
P117 -1
R36
R99
R91
U27
PUMP
Q10
AIR PUMP
P116 -3
P116 -2
P116 -1
C14
1uf
R66
15K 1/8W
LVACFB
R69
330K,1/8W
C27
.47uf
D4
1N4148
U18
MOC8101
D13
1N4003
SOLRTN
P114 -21
P114 -22
P114 -23
P114 -24
R29
150 1/4W
R57
180 1/2W
R50
4.7K 1/2W
Q1
2N3904
R75
4.7K
U20
MOC3010
F7
.75A
Q3
4.0A 100V
HLB
HEELBOT
P114 -12
R32
R60
R51
Q2
R76
U23
F8
Q6
HLM
HEELMID
P114 -11
R30
R58
R52
U21
F5
Q11
HLT
HEELTOP
P114 -10
R33
R61
R53
U24
F6
Q7
KN
KNEE
P114 -9
R31
R59
R54
U22
F4
Q5
ST
SEAT
P114 -8
R34
R62
R55
U25
F3
Q8
HD
HEAD
P114 -7
m121_043


P112-10
P112-1
P112-2
P112-3
P112-4
P112-5
P112-6
P112-7
P112-8
P112-9
P112-11
VBB
RT1
RXE050
VBB2
D11
1N4003
VCC
LM2940CT-5.0
U15
IN
OUT
GND
C22
100uf
D16
SA5.0A
D8
SA18CA
21
.33uf
VSS
CGO
LONA
LONB
R111
120ohm
.5W
D17
SA5.0A
D18
SA5.0A
P113-10
P113-1
P113-2
P113-3
P113-4
P113-5
P113-6
P113-7
P113-8
P113-9
P113-11
NET SHIELD
U17
4N29
R28
150ohm,1/4W
U30
ULN2803
EXAIR/
R83
0ohm
BDXT P111-1
VSS P111-2
SGMIF P111-3
SGMDF P111-4
P111-5
LCD_IN P111-6
CPR P111-7
R38
2.2K, 1/8W
R26
100K,1/8W
C25
.1uf
U29
74HC14
MIF
R39
2.2K, 1/8W
R96
100K,1/8W
C32
.1uf
MDF
R40
470K,1/8W
R98
100K,1/8W
C34
.1uf
LCDIN/
R42
47K,1/8W
R97
100K,1/8W
C33
.1uf
CPR/
P115-1
CPR RELEASE SW/
P115-2
P115-3
NC
R2
1K,1/8W
R11
100K,1/8W
C31
.1uf
C15
.1uf
R22
100ohm,1/2W
CPRSW
R85
0ohm
R84
0ohm
P114-2
P114-25
P114-26
P114-27
U29
74HC14
IO10DATAOUT
U28
CONNCHK/
SELC
ADCS/
IO9DATAIN/
IO8CLK
EECS/
SELA
SELB
U31
SP720AP
R6
1K
1/8W
D19
SA5.0A
SENS_SEL-C
P114-18
R7
10K
1/8W
R73
470K
1/8W
D20
SA5.0A
DATA_OUT
P114-5
R45
1K
1/8W
D21
SA5.0A
A/D_D/A_CS
P114-3
R93
1K
1/8W
D22
SA5.0A
DATA_IN
P114-4
R94
1K
1/8W
D23
SA5.0A
CLK
P114-14
R46
1K
1/8W
D24
SA5.0A
EEPROM_CS
P114-15
R95
1K
1/8W
D25
SA5.0A
SENS_SEL-A
P114-16
R92
1K
1/8W
D26
SA5.0A
SENS_SEL-B
P114-17
R12
100K
1/8W
R72
470K
1/8W
CONN_CHK
P114-13
C35
.1uf

m121_054

# Schematic Wiring Diagram—Sensor Board

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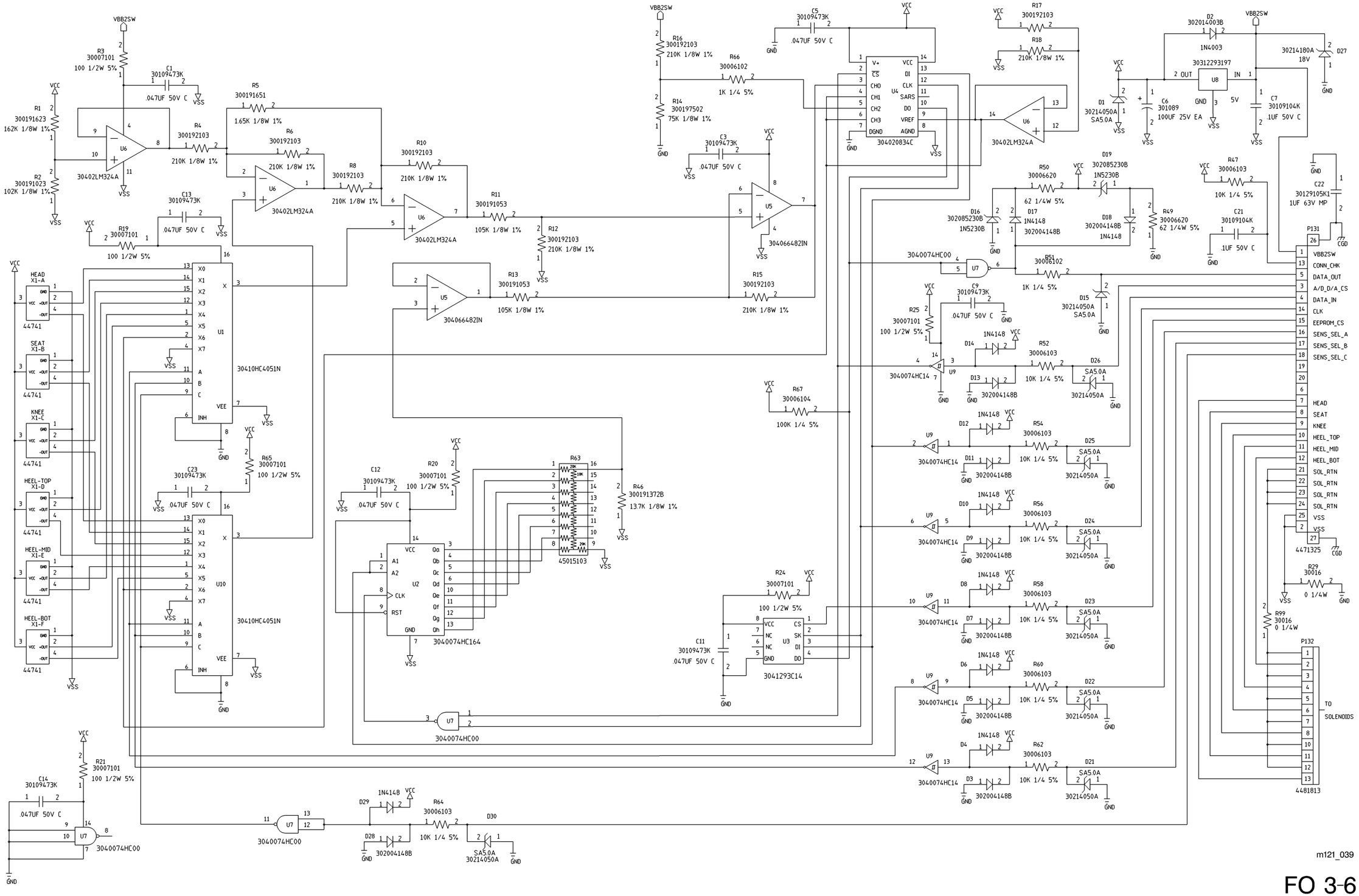


m121_039

FO 3-6